JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CI., No. 2340.——TUESDAY, MARCH 17, 1908.

EDITORIAL NOTES—GAS, &c.

To Demonstrate the Uses of Gas.

A CIRCULAR-LETTER is about to be addressed to the engineers of gas undertakings throughout the country, asking them to lay before their Directors and Committees the claims to financial support of the Gas Section of the Franco-British Exhibition. Since this matter was originally brought to the notice of the gas industry, the whole scheme has taken new shape. It was felt, and earnestly felt, that the gas-supply industry had largely benefited from the considerable spendings upon exhibitions of the manufacturers of, and traders in, gas plant and appliances; and that it would be sheer imposition to ask them to bear the burden of a display at the Franco-British Exhibition. The Committee—representative of company and local authority gas undertakings alike—who have the matter of a Gas Section in hand, therefore decided that now was the time for the gas-supply industry to do their part, in their own interests, and to show their appreciation of what has been done for them in the past, by financially supporting a scheme for a display on this occasion. The change in the whole of the conditions surrounding the scheme enables us to commend the appeal that is being made to gas undertakings throughout the country. It is a no mean point for consideration that the scheme for the section has been completely removed from the old rut in which gas exhibitions have been run. While exhibits have shown gratifying and encouraging progress, the manner of making the displays has been almost devoid of originality. Such displays would not be of the slightest good at a popular exhibition of the kind that is being arranged at Shepherd's Bush. But here we are to have a change. It is proposed to build apartments fitted and fully equipped for demonstrating the most efficient uses of gas for lighting, culinary, and other purposes in the household, and for industrial operations. The demonstration is, if ample funds are forthcoming, intended to be made popularly attractive by giving to the scenes the guise of every-day life in the home and in the workshop. There is great possibility and novelty in the project, if the best can be done through the financial support accorded to it by gas undertakings.

The Committee (of which Mr. J. W. Helps, of Croydon, is the Hon. Secretary) are committed to a display, on the 3000 to 4000 feet of space taken in the Exhibition; and they have already collected nearly £3000. But to carry out their plans on the most creditable and attractive lines, they should—and that almost immediately—have this sum doubled. No one in the gas industry would desire to see at the Franco-British Exhibition or elsewhere a display suggestive of a poverty-stricken or niggard industry; and therefore this appeal to all gas undertakings to contribute with generous hand to making the display one that will command attention. It is hoped that not only will the demonstration be one that will invoke unaided by anything extraneous the attention of the public, but that it will be an object-lesson such as it will pay gas undertakings throughout the country to send their staffs to inspect. The London Gas Companies, and several of the Suburban and Provincial ones, have contributed to the fund; and distance should be no bar at all to support by gas undertakings. London is a centre of attraction for the Provinces in the summer time; and now that His Majesty the King and the President of the French Republic are together going to honour the Exhibition by opening it, there are grounds for believing that the Franco-British Exhibition will be the greatest attraction for sight-seers that the Metropolis will offer this summer. The Gas Section is a matter for the gas undertakings; and their interest in and material support for it are most sincerely urged and sought by the Committee.

The Four and Five Metre Dessau Verticals.

AN article bearing upon the discussion of the relative merits of four and five metre vertical retorts as constructed and as worked under the Dessau system is contributed to our columns by Dr. Harold G. Colman. By applying an admixture of sound reasoning and practical experience to the bare figures published in our columns on Jan. 14 by Herr Körting as to the respective quantitative results—productive, illuminating, and calorific—from the two lengths of retorts, our contributor throws a considerable amount of light upon a somewhat perplexing question, and indirectly challenges the correctness of Herr Körting's method of super-steaming in his retorts, in order to derive an extra make of gas per ton above that realized from the four-metre retort, though sacrificing, on his own showing, a considerable amount of illuminating power. This position notwithstanding, Dr. Colman "hedges" a trifle when he says that, "where illuminating "power is of no consequence, and a high make of gas of "about 550 B.Th.U. is all that is aimed at, Herr Körting is "in favour of the use of the five-metre retort with copious "steaming; and this opinion seems to me fully valid, so far "as it relates to installations of these retorts of the size "hitherto erected, with the possible exception of Cologne." We take it that Dr. Colman has not overlooked the 1¼ million cubic feet installation at Mariendorf mentioned in the opening lines of Herr Körting's article. If he has not, then the quoted statement stands as a courteous but slender concession among the destructive forces that Dr. Colman brings to bear, both before and after it, upon the validity of Herr Körting's opinion; for what does it avail under any set of circumstances to sacrifice illuminating power, if, by other means, all else can be secured without such sacrifice? Dr. Colman has constructed a strong case with the intent of showing that there are such means. His contribution is a valuable one to all who are closely studying the ascertained issues of contemporary carbonizing work on new lines.

The whole question is whether, from the point of view of the gas engineer who has to work under an illuminating power standard, the five-metre Dessau vertical retort shows any producing superiority over the four-metre retort; whether the excess steaming, as practised by Herr Körting, is not entirely wrong; and whether results of greater value could not be obtained by an independent blue water-gas plant, instead of super-steaming in the retort. Herr Körting will reply that reduction of illuminating power is only one phase of the question; and that the comparative costs of super-steaming in the retort and the production of water gas by independent plant is another. We admit the soundness of the lines on which Dr. Colman suggests the construction of a cost balance-sheet of the two methods of working, and that consideration of them influences largely, and completely so far as this country is concerned (for parliamentary illuminating power standards are here inexorable, and must be maintained at any price), to an agreement with him. But Herr Körting will find, from his standpoint of liberty, this part of our contributor's article more inconclusive than that in which he, on *a priori* reasoning, essays to elucidate the mystery of the immense difference in the illuminating power of the gas produced in the five and four metre retorts—a difference of close upon 7 candles—although the variation in calorific power is comparatively of small amount.

Using the figures quoted by Herr Körting in his article, Dr. Colman shows by calculation that the difference between the production of the four and five metre retorts per ton of coal is 2186 cubic feet; that this excess is due to the production of water gas by steaming in the retort; and that if the same quantity of blue water gas generated by a separate plant were added to the production of coal gas made per ton of coal by the four-metre retort, a gas equal in quantity (13,478 cubic feet) to that produced by coal carbonization *plus* steaming in the five-metre retort, equal—and it might be

higher—in calorific power (549 B.Th.U.), but of 14·8-candle power, would be realized. That is to say, from the point of view of gas production, the separate generation of water gas, in place of super-steaming, would give the advantages of the latter without the disadvantage of a loss of 4 candles in illuminating power, and yield savings in the capital costs and fuel consumption (through the lessened length and the absence of steaming) involved in the five-metre retorts. We know there is much to be said on the other side. But the fact remains that the results calculated by Dr. Colman, under his independent method of blue water-gas working, are not much superior either in make or in candle power to those reported as having been produced at Poole—viz., 13,021 cubic feet of 14·2-candle gas—without the use of a separate water-gas plant or the application of any excess steaming. From the technical standpoint (we trust it will not be taken that bias prompts the point), this cannot be ignored. However, the most feasible explanation of the striking reduction of illuminating power in the five-metre length of retort is the one advanced by Dr. Colman—that a portion of the illuminating constituents, consisting mainly of ethylene and benzene, is partially destroyed, owing to the action of the excess steam. With the existence of the illuminating power standard in this country (which is year by year being brought more and more to the 14-candle level), it looks, on the fresh considerations advanced by Dr. Colman, as though the vertical retort competition in this country will have to be, for the time being, between the Dessau four-metre retorts *plus* an independent blue water-gas plant, and a continuous system that will yield results of a value equal to the combined Dessau and blue water-gas plants.

The Old Order and the New.

This is the twelfth year since the amalgamation of the old South-West Association of Gas Managers with the Southern Association. The former in its day owed much to its Hon. Secretary (Mr. Norton H. Humphrys), who was the centre of its being, and the main bond of its integrity until amalgamation put an end to independent existence. Last Thursday, Mr. Humphrys was installed in the chair of the Southern Association; and in the opening lines of his presidential address, a passing reference to the old organization cast thoughts back to the enjoyable little gatherings in the south-west of the country in days now long since. Pondering over this, the fact crosses one's mind that members of the south-west district of the Southern Association are not seen at the meetings in London so regularly as could be desired. Distances are, of course, a drawback to a large representation twice a year; and the return home the same night is an inconvenience if the social part of the reunion is not missed. In this relation, it is not out of place to recall almost the closing words of the President of the South-West Association (Mr. T. W. R. White) at the last meeting of that body in 1896. Referring to the amalgamation, he said: "Let us "try to increase and broaden our sympathies and interest in "Association work. Do our duty as members, come forward "with papers, and join in discussions; then we shall be better "fitted for the responsible positions we occupy." The words were intended as an incentive; and they are worth restoring to memory. On the present occasion, the members from the south-western district came up in fair numbers; and they may be depended upon to give a hearty support to the central figure of their quondam organization in the dignified position that he now holds as President of the largest——both numerically and territorially—of English District Gas Associations.

In his address, the President dealt with many matters, and in a colloquial vein. He looked back; he looked at the present; he looked forward. Looking back to-day, however, is not very profitable, and can, under existing circumstances, only afford the gas engineer and manager transient interest. The times have changed, and gas manufacture, distribution, and use with the times. The supreme question now is not what has been, but what is, and what is likely to be; and having satisfied ourselves from the omens as to what are the probabilities of the future, to prepare accordingly. Take one point—that of lower illuminating power of gas. The President mentioned that in some places not more than 5 to 10 per cent. of the gas sold is used in flat-flame burners; the remaining 90 to 95 per cent. being consumed in incandescent burners, for cooking, domestic and industrial heating, and for power. In one district of which we have knowledge, a canvas two years or so ago showed that only 20 per cent. of the gas was consumed in flat-flame burners; the whole of the 80 per cent. balance being used for purposes in which the luminous capability of the gas is not of the slightest avail. There are those among us, however, who would still legislate for flat-flame consumers, and would for them in a measure sacrifice the consumers and the purposes forming to-day the backbone of the gas business. We have to look forward, not backward; and the sooner all recognize this, the smoother will be the path of progress. The flat-flame burner is a factor daily diminishing in importance in gas supply; and ever-increasing activity in competition urges that, instead of allowing ourselves to be fettered by a condition of things that is being left behind, as much as possible should be done at the present time to cheapen gas, while maintaining a respectable calorific value. In truth, the destiny of the gas industry becomes more clearly defined day by day.

Look forward! That was the dominant note of the whole address. The President is a Progressive in gas matters. He spoke of the greater part of his business career having been spent "in a slow-going, old-fashioned city situated in "a slow-going, old-fashioned part of the country." But no one reading the address will say that environment has infected the President with inertia, or has dimmed his vision, or has blunted his business perspicacity. The vastness of the ground covered by the composition brings home to us that the gas manager of to-day, in his professional life, has to play many parts—technical and commercial; and that therefore equipment for the whole requires a more comprehensive training than was the case with those who entered the profession many years ago, and who have progressively gained their skill and experiences with succeeding change in conditions. The President applauded all that is being done to broaden the qualifications and accomplishments of future chief officials and present and future staffs. But all men have not the mental capacity or the physical strength for advisory and executive responsibilities—technical, managerial, and commercial—that fall upon the chief officer of a gas undertaking in these times; and very proper are the warnings against attempting to cram into the human vessel more than that for which it has capacity. Disaster will assuredly follow; and the otherwise possible efficiency of the individual in some special sphere will suffer, and perhaps be destroyed. Those who excel in intellectual power—in initiative and execution—in the manifold walks of the chief officer of a gas undertaking, will, in spite of resistance, force themselves to the top; and for them, as well as for those who devote time and energy to specializing for some of the sectional work offered by a gas undertaking, the President pleaded for adequate recompense. There must be attractions to induce, encourage, and maintain effort; and votes of thanks which cost nothing more than words do not of themselves sufficiently merit classification under the appellation of "adequate recompense."

In the gas industry, while there is much change, there is no decay. The industry stands in a firmer position than ever to-day; the maintenance of its supremacy over competing industries is a matter for the future dating from the very present. That is the object of current work; and the President portrayed it in interesting language. Upon all sides, inventive energy is being expended in the carbonization departments to escape from old-established ruts, with the view of realizing a greater balance of tactable value. Incidentally an expression of satisfaction fell from the President as to the measure of success achieved at Bournemouth, with continuous carbonization in vertical retorts, by his predecessor in the chair of the Association. Carbonization naturally led to remark as to the transiency of the demand for smokeless fuels other than those already on offer by gas-works. An appended statement by the President—and one not made for the first time, but which may be stimulative of further research—was that, in conducting laboratory tests of coal, he has noticed that the coke that is smothered by being shut up in an iron box, instead of being doused by water, burns more freely in an open grate, and is superior in a marked degree as a fuel for household purposes as compared with ordinary gas-works coke. It is a comfortable reflection that we have in the residuals of gas manufacture a safety and balancing aid to the maintenance of level prices for gas; and to this the President alluded between his references to carbonization and purification. The paper that he read in 1905 before the Association, which showed change in the purification arrangements of gas-works, as exemplified by Salisbury, is fresh in memory; and it is now interesting to

learn that the alterations he then described have been the means of reducing his purification charges to under ¼d. per 1000 cubic feet of gas made. There are undertakings which boast of a lower figure than this; but they are of the minority and are mostly undertakings of a productive magnitude considerably in excess of Salisbury. From this point the address takes us to the changes in distribution produced by residential devolution and the altered uses of gas, which require higher pressures than aforetimes. Change begets change; and nowhere is this better illustrated than in the operations and business of a gas-works undertaking. In his extension work, the President has had recourse to several miles of wrought-iron and steel mains, the smoother interior surfaces of which, and the fewer joints, causing less friction, enable, according to his estimate, the supply of at least 30 to 40 per cent. more gas than an ordinary cast-iron socket and spigot pipe of similar size and under equal conditions of pressure. There are other useful hints in this connection —such as the serviceability of flattened steel pipes for crossing old, solid masonry bridges.

Distribution naturally brought about some consideration of the relations of gas undertakings with consumers; and here again, the President showed that a business competitor would, and does, find in him a keen opponent. Arm-chair management, and the do-as-little-as-one-can policy, are of the old order. The new order is the getting into touch with both consumers and non-consumers; and, in the case of the former, to render advice and service that will ensure the best possible value to be obtained from the gas consumed, and to suggest increased uses for gas. Liberal attention costs money; but it is money well spent in the causes of development and protection. The new policy also assists in knocking on the head those misconceptions as to the Legislature granting gas undertakings copious privileges without any corresponding serious obligations. Once more we have, in the concluding paragraphs of the address, brought before us the inequalities of the incidence of taxation, through the heavy assessments placed upon undertakings supplying gas. It is a question with many ramifications; but the latter find a junction in the gas consumer, who pays not only his own rates and taxes, but in cases, as much as 2d. or 3d. more on every 1000 cubic feet of gas he consumes. Assessment reform is badly needed; and it is among the changes for which we can only hope, but must not build up too great an expectation of ever seeing. The address was somewhat long; but the changes in and surrounding the gas industry comprise a big subject, and to write of them is a big task.

Lessons of the Latest Fire Statistics.

The report of the Chief Officer of the London Fire Brigade for last year has been issued; and it is instructive to take a dip into the contained statistics. The figures referring to fires caused electrically and by gas are, when brought into comparison with the number of consumers, again highly favourable to gas, and prove conclusively, as did the figures published a year ago, that gas is a safer illuminant than electricity. Moreover, the report testifies to the fact that the greater number of the fires in which gas had part were due to absolute carelessness, while those occasioned by electricity could not have possibly been detected before the fire broke out. We will deal with this point presently, after referring to the total figures. In the first place, it is gratifying to note that, notwithstanding the increases in the numbers of electricity and gas consumers, there has been a decrease in the number of fires occasioned by both electricity and gas. Whereas for 1906, 105 fires were included in the report as having been due to electricity, for 1907 95 are reported; and whereas for 1906 405 fires were recorded as having been due to gas, there is for 1907 the marked reduction to 347.

According to recently published returns, there are 29 undertakings supplying electricity in London; and 24 of these give the number of their consumers—five are too coy. The total for the 24 undertakings is 59,389. If, therefore, for the remaining five we allow the generous estimate of between 25,000 and 26,000 consumers, an aggregate of 85,000 electricity consumers will be reached. It will be a surprise if anyone accuses us on these figures of doing an injustice to electricity. The three London Gas Companies have the solid backing of 950,000 consumers; and including the suburban areas covered by the electricity undertakings, and extending beyond the territories of the London Gas Companies, and so supplied by Suburban Gas Companies, there is a total of about 1¼ million gas consumers. If we divide the 85,000 electricity consumers by 95, it is seen that one fire to every 895 consumers occurred during 1907, against an average of one to every 760 in 1906. On the other hand, if we divide the 950,000 gas consumers in the area of the three London Gas Companies by the 347 fires, an average of one fire to every 2737 consumers is arrived at; or if we divide the calculated 1¼ million consumers in the whole territory covered by the 29 electricity supply undertakings, an average of one fire to 3602 consumers is found. These figures are confined entirely to consumers, and do not embrace those incalculable connections such as stoves, fires (there are 670,000, or thereabouts, on hire in the area of the three Metropolitan Gas Companies, which figures take no account of the privately owned ones), engines, and other industrial apparatus and appliances, all of which are used so freely throughout the Metropolitan area. What more is required than the testimony of these figures to falsify the widely advertised statement of the principal competitor with gas, that electricity is the safer illuminant?

It has been remarked that a considerable proportion of the gas fires were due to negligence, and were therefore preventible. A peculiar thing is that in 1906 there were of the total 102 fires due to curtains or window blinds coming in contact with gas-lights; and there was precisely the same number of fires due to the same cause in 1907—102 out of a total of 347. In addition to this 102, there were 22 cases in which clothes, linen, or other goods were ignited through coming in contact with gas-lights or gas-stoves. These 124 cases of gas-generated fires were, we hold, entirely due to carelessness on the part of the users of gas. Again, is it too much to assert that there were 22 fools mixed up with the 22 instances in which fires were caused by seeking for an escape of gas with a light; and that, in view of the warning smell of gas, a large proportion of the 95 fires caused by escapes of gas and 10 explosions of gas, would have been averted if indolence had not prevailed over common sense? And the same might be said of many of the remaining causes of fires in which gas was concerned. But the premonition that gas gives is absent with electricity. There could have been no warning of the 88 fires entered in the report as due to "defective electric circuits," nor of the two attributed to "overheat of electric light," nor again of the one for which a "spark from an electric arc lamp" was responsible. While central station managers continue to set at naught the witness of official statistics such as those quoted in this article, and unblushingly persist in advertising the superiority in safety of their illuminant, we must still harbour the opinion that fresh electric lighting business is very difficult indeed to secure.

The Compensation Acts.

In a paper which has been presented to the Southern Association, and is to come up for discussion at a later date, Mr. Thomas Berridge, of Leamington, makes clear to his colleagues that he has another side to his ability than that of being a successful engineer and manager of a Gas Company's works. The extensive obligations that are imposed by the Employers' Liability Act, of 1880, and the Workmen's Compensation Acts of 1897 and 1906, we are afraid are not sufficiently and seriously appreciated by a large number of employers; but here in this paper (as will be seen by reference to other columns) Mr. Berridge helps all such by bringing into focus the obligations and expounding the provisions of the legislative trio with a clearness that would confer credit on the trained and practised lawyer who is capable of elucidation without the employment of legal diction. The Acts have brought a progressive weight of liability upon employers; and while confession may be made to a belief in the fullest protection being accorded to workmen, the confession is accompanied by the qualification that the full protection should only be granted with adequate safeguards for the employer. Though there is an absence of comment, in the nature of praise or stricture, on the part of the author of this useful compendium of the Acts, it is evident that he is not at all unconscious of one or two provisions of the recent Act that, to arrive at level justice as between employer and employed, ought to be expunged. There is warning, too, as to the necessity of engineers exercising care in securing protection for their undertakings, by way of an indemnity from contractors, when contracts are being carried out on the works. Experiences in contracting-out and in the method of setting aside each year as an accident fund a percentage on wages paid, in lieu of doing business

through the insurance companies, are quoted. In the opening paragraph of the paper, Mr. Berridge says: "I shall "make no attempt to suggest how the liabilities can best be "met, beyond mentioning the various ways in which com- "panies can protect themselves, as it seems to me that is a "matter for each individual concern." Mr. Berridge does not deviate from his resolution throughout; and therefore does not expose his personal opinions to criticism. But we do find that what the Directors of the Leamington Gas Company, and therefore it may be assumed Mr. Berridge, too, consider best for the Company is the setting aside of a sum based on a reasonable estimate to meet the contingencies falling within the scope of the Act. The paper (which is a useful companion to the report issued a fortnight since of the Committee appointed by the Council of the Institution of Gas Engineers) will give a broad foundation on which to place personal opinions and experiences when the paper comes forward for discussion.

A Good Increase at Sheffield.

During the six months ending December last, the Sheffield United Gaslight Company reaped a fitting reward for the enterprise they have shown in reducing the price of their gas, in the shape of a particularly substantial increase in the quantity of gas sold. The gain was over 8 per cent.; and this, be it noted, follows upon an increase in the first six months of 1907 of nearly 9½ per cent. over the corresponding period of the preceding year. One must agree with Mr. Wilson Mappin, the Deputy-Chairman (who presided at the meeting), in his remark that, coming on the top of the large business already done by the Company, it is an indication that the very low price at which they are able to sell gas is greatly appreciated by the consumers, and is leading more and more to its use for manufacturing purposes, and to its extended adoption by small householders. In support of this latter contention, he referred to the fact that, out of the 4290 additional meters fixed during last year, no less than 4216 were 3-light ones —which is the smallest size now fitted up by the Company. No more convincing proof could be adduced than this of the great popularity to which gas is attaining in the humbler dwellings, under such favourable conditions in regard to price as prevail in Sheffield. This, of course, is in no way to be wondered at, seeing the enormous progress that has during recent years been made in securing the custom of this class of consumer in places where the charge for gas is very much higher than in this case. It may be pointed out here that the charges for gas during the half year under review were 1s. 4d., 1s. 2d., and 1s. per 1000 cubic feet—the last-named figure being charged for gas used for motive power. These prices are 1d. per 1000 cubic feet less than those which obtained during the corresponding period of the previous year. The average price for the six months was 1s. 3·04d. per 1000 cubic feet. A protest was entered by Mr. Mappin against Corporation lighting by electricity at a far higher price than the work could be carried out at by the Company. Of course, it is not right that the money of the ratepayers should be so wasted; and equally of course the Gas Company, in the position of very large ratepayers, are more than justified in complaining of it. It is an old grievance, but one that needs continually "hammering away at," if any remedy is to be found.

Wheels within Wheels.

Colossal as has been the impudence of many of the gas and water promotions of recent times that have been conceived and matured at No. 99, Cannon Street, there has not been anything that exceeds in boldness the invitation to the public to invest in a concern that the adventurers floating it style the Water and Gas Debenture and Share Investment Trust, which we believe was known in 1906 as the Water-Works, Lighting, and Power Investment Corporation, Limited. Both titles have appeared, as have the names of most of the Directors, in connection with certain of the heavily capitalized gas and water undertakings with the minimum of backbone that have been launched upon the public during recent years. The present Company, with the title that, literally, suggests a respectable security—what can be better than "Investment Trust?"—seem to have nothing better than a backing of straw. The capital that is said to have been previously privately subscribed by these associates in speculative promotion only amounts to £2000; and there is nothing to show that the whole of the £2000 has ever passed in solid cash from their hands into either the former Investment Corporation or the Investment Trust. Now they are asking the public for £20,000, one-half in nominal 6 per cent. preference shares of £1 each, and half in 10 per cent. ordinary shares of £1 each. The nominal dividends certainly have a solid look about them—on paper; but what of the future? The total of the new share capital authorized by the little clique of original shareholders is £48,000! The main professed object of the Company is to invest in a "large number of selected and progressive gas, water, and electric light companies." Selected by whom? By men who have been concerned in promotions for which we and many other people have had no respect? We feel pretty safe in suggesting that the real object of this new flotation is to finance these men, with the minimum risk to themselves, in their future speculations; for the objects included in the Memorandum of Association are broad enough to allow them to deal with any money the public confidingly put into their hands in whatsoever manner they choose in the gas, water, or electric light undertakings they may promote.

Promoters and Directors.

Most, if not all, the Directors have, as already remarked, been mixed up in some way or other with the No. 99, Cannon Street promotions—some of them very much so; and these promotions we have reason to believe are getting more and more distasteful to the shareholders and to the public. There is one Director of the "Trust" described as a "Gas and Water Company's Manager." That is "Percy Davis, Esq." Not long since there was H. Percy Davies, Secretary to the Water-Works, Lighting, and Power Investment Corporation. H. Percy Davies appears occasionally as a subscriber for one share on the prospectuses of the promotions of 99, Cannon Street. If it is the same man, we congratulate him on his new title of Gas and Water Company's Manager. We hope that the duties of his dual position will not interfere with a proper discharge of his responsibilities as a Director of the Investment Trust. Surely, too, most of the other Directors have now sufficient appointments to occupy their time. But perhaps the sooner they over-strain their capacity for promoting and directing, the better will it be for the public.

Public Application and Commercial Litigation.

Just before going to press, a further copy of the prospectus comes to hand, which bears the announcement that the time for making application for shares has been extended to Thursday, which is most satisfactory evidence that the public has not been attracted by the new venture, although no effort was spared to give it an air of respectability. It is of interest to notice that in the list of commercial summonses down for consideration by Mr. Justice Walton yesterday were cases in which the Amman Valley Gas Company and the Whitland Water and Gas Company were the defendants. The birthplace of both these Companies is not at all difficult to trace.

The Midland Junior Association.

With last Saturday's sitting, the Midland Junior Gas Engineering Association concluded the strictly business meetings of another session; and a stage has thus been reached at which it is natural to turn and take a glance backward. Three sessions now represent the length of time during which the Association has been in existence; and such a period, it must be admitted, constitutes a fair test of usefulness and efficiency. That the Association continues to grow in point of numbers is proof that it is found to serve a useful purpose; while the proceedings afford abundant testimony to its efficiency. The Council report that there are now 134 ordinary members, as compared with 120 and 110 respectively for the two previous sessions. These are big figures; and when note is taken of the wide district from which the members are drawn, their significance as evidence of enthusiasm is emphasized. As to the papers that have been read and the discussions which have taken place upon them during the past session, they "speak for themselves," and therefore nothing need be said about them—except to remark generally that they have in no way fallen short of the high standard of excellence set in this respect during the preceding sessions; and this, of course, applies equally to the address delivered by the President, Mr. W. E. Caton, of Derby. It may be pointed out that there still remains

one fixture to be carried out—namely, the visit which (on the invitation of Mr. J. Ferguson Bell) has been arranged for next month to inspect the gas-works in the President's own town—and this is being keenly looked forward to, with the confidence, which is fully warranted, that it will turn out equally successful as did that which was recently paid, through the kindness of Mr. Hubert Pooley, to the gas and electricity works of the Stafford Corporation. As was to be expected, the resolutions passed at the recent conference in Birmingham of representatives of the Junior Associations in Great Britain were agreed to; and in future the delegates from the Midland Association will attend similar gatherings invested with power to cast a vote binding on the Association on resolutions that have been previously submitted to a meeting of the members. This will enable them to go to the conferences with a full knowledge of the course which it may be the wish of their Association that they should take; and it certainly seems, from every point of view, to be the best arrangement that could be adopted. It will be seen from the election of officers for 1908-9, that Mr. James Hewett has been chosen to fill the office of President; and he is consequently giving up the position of Hon. Secretary, which he has so ably filled from the start of the Association. To a considerable extent the success of such organizations must depend upon the Secretary; and the record of the Midland Junior Association shows how much the members owe to Mr. Hewett.

PERSONAL.

Mr. P. D. Walmsley, B.Sc., of Nuneaton, has been appointed Gas and Water Engineer and Manager to the Wombwell Urban District Council.

Mr. Frank Livesey, B.A., son of the late Mr. Frank Livesey, who, as notified last week, has just been elected an associate member of the Institution of Civil Engineers, has been appointed by the Directors of the Maidstone Gas Company their Assistant Engineer and Manager, in succession to Mr. H. K. Kindler, whose connection with the Company has been severed under circumstances set forth in the last number of the "Journal," and referred to elsewhere to-day. Mr. Livesey was educated at the Charterhouse, from which establishment he went up to Pembroke College, Cambridge. While in residence he studied engineering under Professor Ewing, and took his B.A. degree in Mechanical Science. On leaving Cambridge, he was articled to Mr. James W. Helps, of Croydon, whose assistant he has been since completing his term about six months ago.

At the recent meeting of the Lewes Gas Company, the Chairman (Mr. C. R. Kemp) announced the approaching retirement of Mr. Levi Monk, the Manager, after fourteen years' service. Mr. Monk went to Lewes from Maryhill, Glasgow, in succession to Mr. John Hammond, who removed to Eastbourne; and he was previously in Colombo. Mr. Kemp stated that Mr. Monk's original intention was to stay only ten years at Lewes. He proposed to leave them at Midsummer, and they expected he would be followed by the Assistant, Mr. Edward Jones. Mr. Monk had been an indefatigable worker in the Company's interest, and was thoroughly master of his business. They would lose him with regret; but he gained a well-earned rest after a life service in gas undertakings in various places. Mr. Monk told him he had no intention of entering on fresh business duties. Alderman Miles said he quite agreed with all that had fallen from Mr. Kemp with regard to their respected friend Mr. Monk. The shareholders, he thought, were aware of all that he had done in the interest of the Company; and he (the speaker) personally appreciated very much indeed his valuable services, and would part with him with a great deal of regret.

The Senate of the University of Glasgow have conferred upon Mr. George T. Beilby, F.R.S., the honorary degree of Doctor of Laws. Mr. Beilby has been one of the Governors of the Glasgow and West of Scotland Technical College for a number of years. His services in connection with the scientific side of the work were recognized in September, when he was unanimously elected Chairman in succession to the late Sir William Robertson Copland. Mr. Beilby will be remembered by many of our readers from his association with the late Mr. William Young, about five-and-twenty years ago, in the production of the retort bearing their names, which, though it has been modified in details, remains to this day the standard retort for the distillation of shale. He is the inventor of processes which are in use in several departments of industry, and has specially studied fuel economy and smoke prevention in connection with the coal consumption of Great Britain, on which subject he reported to the Royal Commission on Coal Supplies in 1903. He was President of the Society of Chemical Industry in 1899, and of the Chemical Section of the British Association at the South African meeting in 1905; while he was Vice-President of the Institute of Chemistry from 1903 to 1906.

NOTES FROM WESTMINSTER.

There was greater animation in the lobbies and Committee rooms last week. Lords and Commons Committees were at work on gas, water, railway, and other Bills. Representatives of Welsh promotions and oppositions were in strong force at the Lords end of the corridor. Consideration of water and other schemes was in full swing in certain of the rooms between the Lords' Nos. 1 and 2 and No. 9, where Mr. Whitbread's Committee continued to peg away at the group of Gas Bills entrusted to their investigation. They did not, however, make much progress, for beyond adjusting clauses in the Gosport Gas Bill, the week was practically wholly occupied by the Swinton and Mexborough Bill. The Derby Bill (which provides for the annexation of the Belper and certain private gas undertakings by agreement) has been removed from the group—opposition having been allayed; and the measure will now proceed without any further hindrance. North's Navigation Company have also withdrawn their opposition to the Garw and Ogmore Gas Bill; so that this has likewise been withdrawn from the Committee. The Bromley and Crays Bill was under consideration yesterday; and the Draycott Bill follows, and is expected to be reached on Wednesday. This will complete the group. With regard to water, several Bills have been under investigation. Points concerning a couple of them are noticed in later paragraphs; and the Lincoln and Pontypridd Bills are others that have been before Committees. These will be referred to next week. Both measures have brought about big fights; and when the Committees adjourned at the close of last week, the parties were still in the thick of the fray.

Remodelled Auction Clause. Among sensible amendments of the model clauses, gas companies approaching Parliament this session and henceforth will rank the auction clauses as remodelled by the Lord Chairman and the Chairman of Ways and Means. Conversions and consolidations of capital on the basis of a low percentage dividend have altered the conditions prevailing as to market value at the time when companies paying 10 and 7 per cent. dividends could snap their fingers at the direction of the auction clauses that new issues of capital were not to be made at a price below par. The condition became irksome under the new circumstances; and as has been pointed out in the discussion of the matter in our columns, by Mr. H. D. Ellis and editorially, Parliament has on various occasions recognized this by not taking objection to the excision of the not-below-par condition in the old clauses. There was much absurdity about the condition, for it simply meant that where a company could not get nominal prices for their stock or shares, they had to go through circuitous and expensive formality to arrive at the position at which the stock or shares could be sold at below par value. There is to be no more trouble in this way from the present session. In the remodelling, the not-below-par restriction has been omitted; and no one will regret it. With it much verbiage has been swept away; and the greater freedom that issuing companies have been given in the matter of price does not carry with it any compensatory exactions. The conditions are (as will be seen by the reproduced clause in our "Parliamentary Intelligence") free from ambiguity. The notice that has to be sent to the Board of Trade as to the reserve price fixed by the sellers is to be received by—not merely sent to—the Board of Trade not less than twenty-four hours before the day of auction or the last day for the reception of tenders. The portion of the old clauses denying priority to shareholders has been enlarged to "in the case of a sale by tender, no preference shall be given to one of two or more persons tendering the same sum"—thus eliminating any distinction between shareholders and others. That is about the only condition that may occasionally place issuing companies in a dilemma where two or more persons offer the same good price. There are other small variations in the clauses; but next in importance to the deletion of the not-below-par condition is the new instruction that the issuing company are to send a report, after a sale, in accordance with the terms specified in the last provision of the remodelled clause.

The Renewals Fund. The renewals fund clause appears to be in danger of being killed outright by the authorities. It is to be hoped appearances will be falsified in the result. It will be remembered that it was stated during the proceedings on the Gosport Bill that the Lord Chairman had the clause under consideration, and that something—nobody knew what—was going to happen to it. It cropped up again during the discussion of the Swinton and Mexborough Bill; and when the Southwell Bill was before the Unopposed Bills Committee, the Chairman was at first for cutting without hesitation the clause out of the measure. After a little conversation, however, he consented to leave it in for the time being until a final decision was given. Happy must be those Companies who already have the clause. We cannot understand the reasons for any serious objection to it. It is a prudent clause, making for circumspect and sound finance, and ensuring where put into force the relief of the consumers from the oppression of charges for renewals being lumped on to a single year, or carried to a suspense account, which must be wiped off before reductions in price can be made. It seems a proper thing to establish provision for renewal during the life of a subject—during the period that it is wearing out, or becoming obsolete. The argument against seems to be that with a reserve and insurance fund, the consumers are injured by the provision

of a third fund. We are decidedly of a contrary opinion, having seen the long duration of the burden of renewal when reconstruction or replacement has become necessary. Payment has to be made for renewal at some time or other out of revenue; and better is it that this should be done by easy stages through a renewal fund than by any one of the cumbersome and burdensome alternatives. If, moreover, the renewal fund is abolished, there may at times be a temptation to carry an undue proportion of the cost of work to capital, to the permanent disadvantage of consumers. The renewal fund stands for the consumers' protection, and especially is this so in the case of sliding-scale companies. Therefore, we hope the authorities will not pronounce the death sentence upon this clause, or amend it in such a way that it will not be beneficially operative.

Limitation of the Carry-Forward. Financial limitation in the case of gas companies is the order of the day. The carry-forward in the Gosport Company's Bill has been limited to the equivalent of a year's dividend. There have been cases where it has been limited to the equivalent of a half year's dividend. The equivalent of a year's dividend is not a provision that will bear hardly; but it seems a ridiculous thing to put so many leading-strings on commercial enterprises subjected to competition and regulated by the sliding-scale. To say the least it is childish.

Swansea Valley Gas. A Committee of the House of Lords, presided over by Lord Sanderson, had before them two Welsh Gas Bills last week. Tuesday was fully occupied with the Swansea Valley Bill, which proposes the incorporation of a Gas Company to take over the Pontardawe, Ystalyfera, and certain private gas-works, and to supply a large but sparsely populated district. There was nothing of a particularly contentious nature about the measure as it came before the Committee, excepting that the Swansea Gas Company (for whom Mr. G. Thornton Andrews came up to give evidence) and the Swansea Rural District Council had objections. The Swansea Company do not, and rightly so, like having a Company on their borders with a title so similar to their own, on account of the confusion it may occasion; and furthermore the extended area proposed to be taken in by the new Company comprises parts which would come into the Swansea Company's own district of supply if, as is anticipated, the boundaries of the borough of Swansea are later on extended. The Rural Council were naturally anxious, too, to exclude Glais and Llansamlet from the area of the new Company, as the Swansea Company would supply with gas these parishes more cheaply than the Swansea Valley Company. The Committee, however, were not sympathetic with either of the objectors; and they allowed the Bill to proceed without alteration. But this decision requires explanation. The Bill is not in all respects quite the same as when it was deposited. At the time it was under review in its original state in these columns, criticism was made of the large amount of capital (£62,500, including borrowing powers) the Company were asking for, with a gas consumption somewhere in the region of 12 million cubic feet, which the cheerful optimism of Mr. E. H. Stevenson (who, with Mr. R. B. Silcock, was for the Bill) believes will soon reach 20 millions. Even so, the capital asked was extravagant. The local authorities in the district were of our way of thinking; and, by agreement, the capital was reduced, before reaching the Committee, to £30,000, with one-third borrowing. The standard price in the deposited Bill was 5s. This was lowered by agreement to 4s. 9d.; and in two years' time it is to come down to 4s. 6d.

Llanelly Gas. Following the Swansea Valley Gas Bill, the promotion of the Llanelly Gas Company was taken in hand by the same Committee; and their Lordships' time was occupied with it part of Tuesday, the sittings on Wednesday and Thursday, and again part of Friday. There was a great deal of triviality imported into the case; and it is difficult to see why the District Council and the Company could not, without going before the Committee, have arrived at an agreement covering the little that the former have gained by their expensive fight. There is one good thing, however, that may be expected to issue from the fight. Until quite recent times, the Company have not made any notable headway; but latterly there has been increased activity, and the proceedings before their Lordships should induce even more spirited business action on the part of the Board. The Company have got 10,000 houses in their district; and they are only supplying 2500. The potentialities here are good. Admittedly it is an expensive district to work, having regard to the character of the subsoil, and the fact that the consumers are generally of the small class. On the other hand, the Local Authority have acted in a repressive rather than an encouraging manner towards the Company; but the Council are not altogether to blame for what has happened. The Company ought to have been in Parliament before, brought themselves up to date, and made a better name for enterprise. The Company asked in their Bill for £60,000 of new capital, with one-third borrowing powers, and further loan capital on the old share capital (to reach the statutory limit) of £4166. The Committee have allowed them £45,000, one-third borrowing powers, and the £4166 on the old capital—making in all £64,166—total £84,166. The Company have to thank Mr. H. E. Jones, Mr. E. H. Stevenson, and the Secretary and Manager (Mr. Thomas Acland), for getting through without still greater curtailment. The Council—through their Counsel and Mr. Charles Hunt and Mr. William Cash—pressed hard for a new capital that would not have reached, with borrowing powers, more than half the amount granted. A small capital, however, does not always have the effect of bringing a Company under parliamentary review after a few years interval; it has with some people the effect of stunting enterprise so as to husband capital, and avoid the expense and trouble—and sometimes unpleasant experiences—of applications to Parliament. The Council also wanted to reduce the proposed standard price from 4s. 3d. to 3s. 8d. in the borough and from 4s. 6d. to 4s. 2d. outside. But the Committee would not consent to this. There has been an arrangement by which the Council waive their old right, granted 34 years ago, to appoint a Director; in lieu of this, they are now to have the Auditor's certificate that the Company are supplying gas for public lighting at a price at least as low as is charged to any other consumer.

A Purchase Clause. The evidence that was given in the matter of the Swinton and Mexborough Gas Company's Bill before Mr. Whitbread's Committee showed conclusively that, before the undertaking came under the present management, there had been a great deal of lethargy and a disposition to let things get into a loose and disorganized state; and on top of this came competition from municipal electricity works, which have themselves been a miserable failure. Under the circumstances of a record of indifferent management until quite recent times, what can be expected but that, notwithstanding the retention of clever legal men and experts in putting the best possible complexion upon an unflattering condition of affairs, when the affairs of a company of this kind get before a Committee of the Houses of Parliament, the past actual state of management will, with equally clever men on the other side, be exposed in its most lurid light. It was so exposed in this case. Mr. Henry Woodall (Messrs. Corbet Woodall and Son) and Mr. E. H. Stevenson were for the promoters; and they did their level-best for their clients. The Swinton Council were not in opposition; but the Mexborough Council were, and their expert witnesses were Mr. H. E. Jones, Mr. Charles Hunt, and Mr. William Cash. This is a non-statutory Company; and the Committee, on the ground of past bad management alone, granted a purchase clause with the conditions attached that the Swinton and Mexborough Councils should jointly promote a Bill, and in the next session of Parliament. No one who heard the evidence, or who peruses the report published elsewhere, can deny that the Committee had not reason for their view that "the condition of the Company, both with regard to management in the past, and the state of their plant and mains, was justification for the petitioners to require the insertion of a purchase clause." There are other companies who should take warning from this, and set to at once putting their houses in order; for unquestionably the day will come when their history will be unfolded and criticized before a Committee of Parliament. The Company without doubt have a difficult district to supply—all companies operating in colliery districts have; but there are companies in analogous districts who would laugh at the leakages spoken to in the Committee rooms as applying to Swinton and Mexborough, and who would wonder how dividends were made under the circumstances. Another point that received prominence in the case was the competition of the municipal electricity undertaking. Such competition is a matter that Parliament should take into consideration in connection with well-managed non-statutory gas undertakings when purchase clauses are requested. Business conditions are changed from what they were formerly, when purchase clauses were dropped into non-statutory Bills for the mere asking. It is not right for a local authority to cause depreciation of the value of a small gas undertaking by electrical competition, and then to desire Parliament to give them powers of purchase. The capital proposed in the Bill has been reduced to £25,000, with one-third borrowing powers; and the standard price to 3s. 6d. These figures fall far short of the original ideas of the Company; and now, unless the Councils fail to promote a Joint Purchase Bill, the full benefits of the new measure will not be felt by the Company.

Obligations of Liverpool. There was a discussion on the Liverpool Corporation Bill on Thursday night in the House of Commons, owing to Warrington and Prescot having grievances regarding water provisions in the measure. The Warrington Corporation have had the right since 1887 to call upon Liverpool to supply the borough with water. The right has never been exercised; and now Liverpool are asking that it should be extended for a period of three years, and then cease. Warrington naturally objects to be deprived of a statutory power. In the case of Prescot, the town is under an obligation to take water from Liverpool, and Liverpool to supply for domestic purposes at a sufficient pressure to serve the highest house in Prescot. Liverpool now desire some relief from their responsibility in this respect, having visions of skyscrapers on top of hills and so forth, and the laying down of special plant to supply them. The Prescot Corporation are unwilling they should have the relief. The representatives of the two boroughs did not press for a division on second reading, but reserved their right, if these matters are not set straight according to their views in Committee, to oppose when the Bill comes up for third reading.

West Bridgford Water. Judging from the array of Counsel and the crowded state of Mr. Mooney's Committee room from Tuesday to Wednesday last week, a great deal of local interest was aroused by the proposals of the West Bridgford Bill, which suggested the severance and acquisition of that

portion of the Nottingham Corporation water undertaking which is situated in the West Bridgford Council's administrative area. The suburb wanted to be independent of Nottingham; the discontent with the existing arrangement having apparently arisen when the Corporation towards the latter part of 1906 doubled the 12½ per cent. excess charge on the water supplied beyond the city boundaries. The people of West Bridgford were incensed, and "Independence" became their war-cry. They got out a scheme for a water supply of their own, estimated to cost in all £50,000. In negotiations which followed, Nottingham do not appear to have adopted any dog-in-the-manger attitude, but actually offered to revert not merely to the conditions of 1906, but to supply West Bridgford on precisely the same terms as those prevailing in the city. The resentment and activity of West Bridgford therefore had one good effect; but West Bridgford were heart and soul for independence. Hence the Bill. Mr. W. H. Radford, Professor Kendal, Sir Alexander Binnie, and others supported the scheme; while Mr. W. B. Bryan, Mr. E. M. Eaton, Mr. Cope, Mr. F. W. Hodson, and others were on the opposing side. Nottingham and West Bridgford it was contended by the latter were one, and the scheme would inflict a loss on the ratepayers of the district. But why traverse the evidence, when the Committee simply rejected the measure? The act carries its own tale.

Conway and Colwyn Water. The Conway and Colwyn Bay Water Board having exceeded their statutory powers, have to pay for it. They are securing their supply from Colwyn Lake; and on the works and embankment £60,000 have been spent. They now require £25,000 more for a second main, which has become necessary to meet the requirements of the district. In constructing the works, they raised the embankment 2 feet beyond the 4 feet authorized; and thus stored more water than they were entitled to. Large works are being erected by the Aluminium Corporation on the banks of the river; and they claim that the Board should compensate them in respect of the additional water they are impounding. The Board could not resist this; and on the Bill for additional powers coming before Mr. Mooney's Committee, there was postponement to allow of efforts to come to an agreement. These were successful; and the Committee were informed of the terms last week. The Board have undertaken to provide the Aluminium Corporation with 532,000 gallons of compensation water per day in addition to the 1,364,000 gallons to which the ordinary riparian owner is entitled, and to pay monetary compensation in the event of damage arising to the Corporation from shortage of water. The works constructed by the Board in excess of statutory authority are confirmed by the Bill. Under these conditions, the Bill goes forward without impediment.

Lutes of Telescopic Gasholders.

Messrs. Samuel Cutler and Sons, under yesterday's date, write: "We observe in the last issue of the "JOURNAL," p. 632, reference is made to a patent granted to Mr. J. W. Scott and Messrs. R. & J. Dempster, relating to the lutes of telescopic gasholders, and describing an arrangement for preventing the overflow of water down the exterior sides of the gasholder. We beg to suggest that this cannot be described as a novelty; for the extending of the dip-plate so that the water on the outside can rise to a higher level than that on the inner side of the lute is a very common arrangement in our experience. As to the providing of openings in the cup rim this also we have carried out—notably in the case of a gasholder originally erected by us to which we added an additional lift, in the year 1900, according to the designs, and under the direction, of Mr. F. S. Cripps.

The Council of the British Association have nominated Professor J. J. Thomson, F.R.S., Cavendish Professor of Experimental Physics in the University of Cambridge, to be President of next year's meeting of the Association, which is to be held at Winnipeg from Aug. 25 to Sept. 1; and it is understood that both the Dominion Parliament and the authorities of the city will make grants towards the expenses of the meeting.

Speaking at Port Sunlight, at the annual meeting of Lever Bros., Limited, last Friday, the Chairman (Mr. W. H. Lever, M.P.) mentioned that out of 800 acres of land they had bought at Bromborough, of which they required only 120 acres for their works, they had sold 24 acres to the Bayer Aniline Dyes Products Company, the largest German Company of the kind, with a capital of £13,000,000, which, like other foreign concerns, were setting up works in this country as the result of the new Patents and Trade Marks Act.

We regret to learn, from the current number of the "Co-partnership Journal" of the South Metropolitan Gas Company, of the recent death of Mr. C. W. Tanner, who for forty years was in the service of the Company—first as foreman and afterwards as General Foreman at the Old Kent Road—and retired on a pension a few years ago. He was a thoroughly practical man, and (in conjunction with the late Mr. Frank Livesey) devised an improved hydraulic overflow which was adopted at the Company's works. It was due to a suggestion of his that the co-partnership system, which is now so important a feature of the Company's work, was initiated; and he watched its growth with keen interest. He died, at his residence at Herne Bay, in his 76th year, and was interred at Forest Hill.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 727.)

THINGS on the Stock Exchange last week were not quite all that could be desired. They were not uniformly bad, and there were some alternations of sunshine and shadow; but on the whole the shadow decidedly predominated. One potent prop which sometimes saved a fall from being serious was the continuing promise of cheaper money; and people began to talk about a 3 per cent. rate. Then the American Market—a factor always to be reckoned with—displayed a gratifying recovery. On the other hand, the competition of new issues had a lowering effect on the gilt-edged list. There was no strength in Home Rails; and the fortnightly settlement—which was at first looked forward to without uneasiness—gave rise to some anxiety, and culminated in a failure. The volume of business was light. The opening was steady, but Consols were down before the close. Tuesday was more cheerful, and prices in general showed a moderate recovery. Next morning the wind blew from a bad quarter again; and pretty well everything was hove down. But before closing, a favourable breeze came from the American quarter; and they all brightened up once more. On Thursday, and again on Friday, the old dullness was back again. Consols continued to recede, and prices in general were on the whole poorer. There was something by way of improvement on Saturday—conspicuously American—but Consols did not share in it, and even fell lower. In the Money Market, there was a good demand in connection with the Stock Exchange, and rates held firm. Discount was steady at first, but gradually gave way to an easier position. Business in the Gas Market was well up to the average in the earlier part of the week; but it tailed away to next to nothing by the close. One or two of the big issues were a little easier; but, on the other hand, a great many of the rest advancing, reduced the general position. In Gaslight and Coke, the ordinary on Monday touched 94¼, but quickly recovered, and marked 95¾ more than once. The secured issues scored advances; the maximum being done at 87½ and 88½; the preference at from 106½ to 108; and the debenture at 83 and 84. South Metropolitan was steady and rather quiet, and was done at from 121 free to 122¼. The debenture marked 84¼. Commercials made only one bargain in the 3½ per cent. at 104, and one in the debenture at 83¾. In the Suburban and Provincial group, Alliance old changed hands at 20⅝ and 20½, Bournemouth "B" at 16¾, North Middlesex new at 17, and West Ham at 101½ and 102. The Continental Companies were very quiet. Imperial receded a point at from 179¼ to 180½, Union marked from 116 to 117½, and European part-paid 16¾ and 17. Among the undertakings of the remoter world, Buenos Ayres was done at 11⅝ and 11 11/16, Cape Town at 4, Primitiva at 5 1/16, ditto preference at 4 13/16 and 5, ditto debenture at 93¾, River Plate at 13⅝ to 13 15/16, ditto debenture at 94¼ and 95, and San Paulo at 13¼ to 13⅜.

ELECTRICITY SUPPLY MEMORANDA.

Progress of the Electricity Supply Industry—The Best Power Supply Districts—Public Lighting and Other Notes—Further Instances of Misrepresentation—Cardiff Public Lighting—Unfair and Unscrupulous Tramcar Advertising.

THE "Electrician" has this year further increased the handiness of its annual statistics relating to the electric light, power, and traction undertakings of the United Kingdom. No longer is it necessary to seek the aid of a desk of broad dimensions on which to spread the extensive sheets of figures which in their very quantity were somewhat confusing to the eye. The tables were last year split up into sections, and paged in book form; and this year the pages have been further reduced in size, but not the printing. The additional convenience makes it a greater pleasure to consult them than was formerly the case. The undertakings without tram loads that are dealt with on this occasion number 273 against 275 last year; but the number of electricity stations supplying both lighting and tramways has risen from 125 to 132. There is also an increase of 7 in the towns taking electricity in bulk—the rise being from 21 to 28. The power undertakings numerically have maintained their *status quo*. Particulars are, as last year, given of fourteen power companies, and of eleven that have made a small start, or are preparing for business, or are leaving well alone by letting their schemes remain on paper. In most cases, experience has shown that there is more money to be made by investment in other directions than in electricity power and bulk supply concerns. There are 42 ordinary electricity stations in progress or projected, four of which are also included in thirteen projects for taking supply in bulk. We are pleased to see that the misleading conversion of connections to a basis of 8-candle power lamps has been abandoned. The figures obtained by this method were no doubt worth looking at, but they were worthless as indicative of the real state of business done. The metallic filament lamps have made the very rough method of measurement still more meaningless; and so the "Electrician" has discarded it. According to the present tables, the connections in London represent 294,824 kilowatts, or an increase of 39,302; in the Provinces, 955,242 kilowatts, or an increase of 119,449. Taking the municipal supplies in both London and the

Provinces, connections represent 823,550 kilowatts, or an increase of 113,867. Taking the companies in London and the Provinces, the total connections represent 426,516 kilowatts, or an increase of 44,884. Over the whole supply—municipal and company—the connections are therefore equal to 1,250,066 kilowatts; being an increase of 158,751. The greater part of this increase appears to have been supplied by those provincial undertakings with tramway loads, and situated in industrial areas where electric driving has more than ordinary scope.

But districts where there is good scope for electric driving are a small minority in the total number of electricity undertakings dealt with in the returns. Therefore the movements in power supply in the majority of towns are seen to have been very slow; while in the specially favoured localities, such expansions in power supply as the following have been made during the year: Birmingham from 5000 to 8100 horse power, Bolton from 5520 to 7276 horse power, Charing Cross (West-end and City) Company 9760 to 12,269 horse power, Coventry 2346 to 3881 horse power, Edinburgh 7388 to 8249 horse power, Glasgow 11,964 to 19,805 horse power, Leeds 6175 to 8000 horse power, Liverpool 6279 to 8639 horse power, Manchester 12,110 to 20,000 horse power, Newcastle-on-Tyne 6500 to 7250 horse power, Salford 6054 to 8800 horse power, Sheffield 6300 to 7500 horse power, and Sunderland 9782 to 10,031 horse power. The managers of the electricity undertakings in residential districts must look with envious eyes on these figures, which year by year dwarf more and more their own almost unvarying power connections. The London undertakings, notwithstanding the low prices for power to which they have mostly dropped, are unable to show, generally speaking, any really substantial gain in power connections, save in the industrial area. Comparing the statistics as to consumers of all kinds, some undertakings have made respectable progress; but it is a fact that, contrasting several pages of the figures with the corresponding pages last year, quite a number are found to have stood practically still. Treating in the same way the data as to prices charged, the variations are not so great as we had anticipated to find them, but the higher prices of coal and the threatened reduction of the consumption of electricity by lighting consumers owing to the adoption of metallic filament lamps have no doubt had an effect in maintaining the old rates. Concerning public lighting, it is difficult to ascertain from the tables the extent that the flame arc is being used, as in certain cases we notice there is no discrimination between flame arcs and arcs of the older types—all are lumped together in one total figure. But if we take the information as it is given, it may be said that, in the Provinces, the flame arc lamp has not, excepting in isolated instances, made any notable progress in street illumination, though its performances have been vigorously heralded. A special column has now been opened up in the tables for the nernst, tantalum, osram, and other metallic filament lamps used in public lighting. But looking down the column, it would appear that public lighting authorities are going slowly and tentatively to work in the direction of applying the newer lamps for street purposes. The "Electrician" thinks that their use is likely to become general "if it is found that such lamps can, without difficulty, be burned in series." In public lighting, changes in charges are again the exception and not the rule.

It would be more becoming on the part of electrician letter writers and of the recorders of electrical intelligence if they exhibited more candour, less evasion, and less pretence. A couple of fresh instances of misrepresentation are before us. Mr. Cecil W. Falcke is the Engineer of the Stratford-on-Avon electricity works; and he has let himself go in the "Electrical Times" on the subject of the relative cost of electricity and gas. He expresses a considerable amount of pleasure in quoting a case of "saving" by the use of electricity in a "large house" on the mains of the undertaking of which he has charge. In the December quarter of 1906, gas in the house cost £9 5s. 6d.; and in the corresponding quarter of 1907, £8 14s. 8d. was paid for electricity. Readers are left to assume from the comparison that the money paid for gas was entirely for lighting purposes. The figures themselves suggested that the truth was being hid. With gas at 2s. 10d. per 1000 cubic feet the £9 5s. 6d. would purchase 65,464 cubic feet; and if all this was used for incandescent lighting, taking the very moderate duty of 18 candles per cubic foot per hour, that volume of gas would represent 1,178,352 candles. The £8 14s. 8d. paid for electricity would purchase, at 5d. per unit (there is sufficient margin to neglect the 2½ per cent. discount), 419 units, which would be equal to 419,000 watts. Assuming that the house was lighted by 1 watt per candle metallic filaments (readers must not conclude that such lamps are in existence), there we have represented 419,000 candles. But the house is not lighted by even the best metallic filaments, for Mr. Falcke (and this is about the only frank point about his letter) states that "there was not a large proportion of metallic filament lamps in the installation, and those installed were not of the most economical type; the remainder being ordinary carbon filament lamps." This being so, we may take it the consumption of electricity was equal to about 3 watts per candle power; and therefore the candle power represented by the 419 units would be 139,666 candles. On their very face, the contents of Mr. Falcke's letter were ridiculous. The £9 5s. 6d. paid for a quarter's gas is a definite, traceable figure. And we have no hesitation in asserting that Mr. Falcke omitted to state that, in the house in question, the largest size of a well-known make of gas-cooker was used; and there is little doubt that about one-half of the gas represented by the £9 5s. 6d. was used for cooking in the "large house." The same householder has a gas-heating stove; and Mr. Falcke's figures refer to a winter quarter. Were these facts unknown to Mr. Falcke before he penned his letter to the "Electrical Times," or has he purposely suppressed them to make good his comparison? Does Mr. Falcke, too, happen to know of a tradesman in Stratford whose bill for electricity in the December quarter was £8 13s. 8d. *plus* £1 for gas—total £9 13s. 8d.? Does he further know that this consumer's average payment for gas in the December quarters of five years was £2 16s.? If Mr. Falcke does not, inquiry will show him it is so; and that the tradesman in question is now paying for the one quarter £6 17s. 8d. in excess of what he did formerly—the excess being practically equal to a year's consumption of gas under his former arrangements. This is only a single instance; more can be obtained if necessary. But Mr. Falcke did not make use of any of these adverse examples in his letter; relying entirely on a case in which by an incomplete statement of facts there was a considerable distortion of the truth.

Another startling statement in an electrical contemporary is this: "Cardiff.—The Electric Lighting and Tramways Committee has decided to allocate £1000 per annum for six years for substituting electric lamps for the present gas-lamps." Misrepresentation may be a small matter to whoever is responsible for drafting this paragraph; but it is not so to other people. The way the announcement would strike those in the outer world is that in Cardiff gas for public lighting is doomed beyond all chance of reprieve. What has really happened is this. That, by a little stretching of conscience, someone dropped out of the paragraph the words "incandescent gas," and otherwise ill-treated to a point that savours of gross misrepresentation the actual resolution passed by the Committee. The Committee's resolution runs: "That the proposal to include a sum of £1000 per annum in the street lighting estimates towards the cost of conversion of lamps in the city to incandescent gas and electric lamps be approved, and the Council be recommended to sanction same." This is an altogether different story. As a matter of fact there has been a decided turn in favour of incandescent gas lighting by the Cardiff Lighting Committee; they having satisfied themselves that incandescent gas lighting, and more particularly, the intensified gas lighting which the Gas Company recommended some years ago, is best for street lighting. Accordingly they are proceeding with the conversion of lamps from the flat flame to the incandescent system as rapidly as possible; and it is more than probable that the amount allocated by the resolution will be applied to this purpose. We have no doubt, however, that the Cardiff Corporation, like other municipal bodies with electricity undertakings, have a leaning towards electric lamps where cables are laid; so that our remarks must not be construed as meaning that there are not to be any extensions of public lighting by electricity. The electrical press should certainly advise their correspondents—electrical and journalistic—to exercise a little more care and discretion in forwarding matter for publication.

The suffragettes are not the only ones who can claim shrewdness in advertising methods. The Stalybridge, Hyde, Mossley, and Dukinfield Tramways and Electricity Board are claiming an equality. They have taken advantage of their ownership of the tramways to advertise the well-worn, but uncorroborated, statement that "electricity is cheaper than gas." So taking advantage of opportunity, the Board show their shrewdness in advertising; but with thousands of pounds of deficits as indicated by the published returns, the shrewdness it is evident could well be exercised in other directions. But we would point out that three out of the four of the local authorities represented on the Board own gas-works, and the use of the public tramways for inflicting an injury, through unscrupulous statements on the public cars, ought to be put down with a firm hand, or on the other hand side by side with the electricity advertisement the Gas Departments should be allowed a joint advertisement. They only want fair play; and we cannot imagine any town either in Cheshire or Lancashire not allowing them that. The price of gas for lighting varies between 2s. and 3s. in the four towns. But take the price of gas at Hyde—2s. 9d., with 7½ to 20 per cent. discount—and the charge per unit for electricity at 3½d. The 2s. 9d. and the 3½d. leave such a big margin between the value obtained in favour of gas, that we can afford in considering the matter to ignore the substantial discount allowed on its price. Supposing 1000 cubic feet of gas are used for lighting purposes in an hour, any intelligent consumer can, from its consumption, get 18,000 to 25,000 candles, according to the burners he employs; while for 2s. 9d. he can only purchase 9¼ units of electricity, which, if used in an hour, with carbon filament lamps would only give him about 2375 candles, and if used in the osram metallic filament lamp (reckoning on the modest consumption of 1·2 watts per candle) would only give him about 7900 candles. So much for the cost. The advertisement also gives a terrible list of the iniquities of gas, which gas consumers from their experience will promptly treat with the ridicule deserved. When electricity purveyors talk of the "perfect safety" of their illuminant and of "strong" electric lamps, they are simply advertising their own moral obliquity.

Recovery of Cyanogen.—At to-morrow's meeting of the Yorkshire Section of the Society of Chemical Industry, to be held in Sheffield, Dr. J. Grossmann will read a paper "On the Recovery of Cyanogen Compounds in the Distillation of Coal, and the Disposal of Effluents from Ammonia Stills."

THE FOUR-METRE AND FIVE-METRE "DESSAU" VERTICAL RETORTS.

By HAROLD G. COLMAN, Ph.D., M.Sc.

THE highly important article on the "Dessau" vertical retorts contributed by Herr E. Körting to the "JOURNAL" for Jan. 14—full as it is of most valuable facts and figures—will no doubt have been carefully studied by all interested in the question of the carbonization of coal, and will have afforded them much food for thought in many different directions. In the following remarks, I do not propose to enter into any general discussion of the matter contained in that article, but intend to confine myself solely to some considerations arising out of the figures given by Herr Körting of the results obtained with the four-metre and five-metre Dessau verticals, which raise interesting questions regarding the changes brought about by the introduction of steam in considerable quantity into the retort during carbonization.

Herr Körting's communication makes clear a point which I think had not been fully realized, at any rate on this side of the water—namely, that the increase in the length of the retort by 1 metre was made, not so much with the object of increasing the size of the unit, and consequently increasing the quantity of coal carbonized per retort, but rather to give an additional depth of coke in the retort, in order that the latter might be simultaneously employed as a water-gas generator by the introduction of considerable quantities of steam, thus showing a much higher make of gas per ton of coal, which, however, still has a sufficiently high calorific power. It would nevertheless be of great interest to know the results obtained by working the five-metre retorts in the same manner as the four-metre retorts—viz., only using sufficient steam to avoid trouble from "carbon" in the retort.

To facilitate reference, it will be convenient to reproduce here the table of results given by Herr Körting, omitting the columns stating the results in metrical units, and only showing those in British units. A column has also been added giving the calorific power results at 15° C. and 760 mm. (which is practically identical with the British standard figures of 60° Fahr. and 30 in.), as in Herr Körting's table these are corrected to 0° C. and 760 mm., while those for make of gas and illuminating power are corrected to 15° C. and 760 mm. In the text of his article, Herr Körting sometimes refers also to the calorific power figures corrected to 15° and 760 mm., which is apt to create a little confusion. In the present communication all statements as to calorific power are given as the "gross" figures corrected to 60° Fahr. and 30 in.

Comparison of Five-Metre and Four-Metre Retorts.

October, 1907.	Production at 15° C. & 760 mm.		Illuminating Power Carpenter Burner at 15° C. and 760 mm.	Calorific Power B.Th.U.	
	Cubic Feet per Ton.	Cubic Feet per Retort per Day.		At 0° C. and 760 mm.	At 15° C. and 760 mm.
Five-metre retorts	13,478	14,974	10·80	577	546
Four-metre retorts	11,292	14,056	17·70	631	597
Difference	+2,186	+918	−6·90	−54	−51

A comparison of the results of make per ton and calorific power in the two types of retort shows that, substantially, the increased make of 2186 cubic feet per ton obtained with the five-metre retorts is due to the increased production of water gas in the retorts; for if the gas obtained from the four-metre retorts (11,292 cubic feet of 597 B.Th.U.) were to be mixed with 2186 cubic feet of blue-water gas, the calorific power of which is taken as 300 B.Th.U., there would result a mixture of 13,478 cubic feet of gas having an average calorific power of 549 B.Th.U., which is almost exactly the result that has been obtained with the five-metre retorts. But while this is true, it is evident that in the latter retorts (in addition to the production of the water gas) some changes must take place in the coal gas, which result in a depreciation of its illuminating power, as this figure (10·80 candles), compared with the illuminating power of the gas from the four-metre retorts (17·70 candles) is reduced to a much greater extent than can be accounted for by a mere dilution with some 20 per cent. of water gas. It is impossible to calculate the illuminating power of a mixture of coal gas and water gas in the same manner as can be done for the calorific power, as this can only be ascertained by direct experiment. But from the various trials which have been made in different quarters, as to the effect on the illuminating power of adding blue water gas in the hydraulic main of horizontal and inclined retorts, in quantities not exceeding 20 per cent. of the coal gas, it appears that the decrease in candle power is less than proportional to the added percentage of water gas. It is true that as the water gas is added to the hot coal gas in the hydraulic main, it will retain some of the benzene which would otherwise have gone away with the tar—thereby increasing the illuminating power. But this is equally the case with the five-metre retorts, as the water gas there produced mixes with the hot coal gas even in the retort; and as the quantity of benzene in the tar from vertical retorts is stated to be much higher than in that from horizontal or inclined retorts, one would expect to obtain even more enrichment from this cause with the five-metre retorts. In any case, if it is assumed that the illuminating power of the mixture will be lowered proportionally to the amount of the added water gas, the calculated result will, I think, not err on the side of being too high. On this basis, the illuminating power of a mixture of 2186 cubic feet of water gas with the 11,292 cubic feet of 17·70 candle gas obtained from the four-metre retort would be 14·80 candles; whereas the actual illuminating power of the same volume of gas per ton obtained from the five-metre retorts was only 10·80 candles.

The question then naturally arises as to how such reduction is brought about. Failing analysis of the gas from the two classes of retorts, it is not possible to speak with absolute certainty; but the great probability appears to be that in the five-metre retorts, a portion of the illuminating constituents of the coal gas—mainly consisting of ethylene and benzene—is partially destroyed. Such decomposition might be due either: (1) To the greater length of travel of gas through the retort, or (2) to the action of the excess of steam used in the five-metre retort. The first cause may be, and probably is, operative to a slight extent; but in view of the fact that the gas travels chiefly up the cool central core of uncarbonized coal, it seems very unlikely that anything more than a small reduction in the illuminating power would be brought about in this manner. It is much more probable that the second cause suggested above is the true one. So far as I have been able to discover from available literature, very little investigation of the action of steam at high temperatures on ethylene, marsh gas, and benzene, seems to have been carried out; but all analogy seems to indicate that these—and especially the less stable ethylene—will undergo a partial decomposition closely resembling the water gas reaction, yielding with the steam a mixture of carbonic oxide, carbonic acid, and hydrogen, in the manner represented by the equations

$$C_2H_4 + 2H_2O = 2CO + 4H_2$$
$$C_2H_4 + 4H_2O = 2CO_2 + 6H_2$$

Benzene vapour would most likely require a higher temperature in order to undergo similar decomposition, and marsh gas a temperature higher than that necessary for benzene.

Subject to confirmation by direct experiment, this partial decomposition of the ethylene by the excess of steam appears to me the most likely cause of the reduction of illuminating power, as until quite near the end of the carbonization period, ethylene is being evolved from the central core throughout the full length of the retort; and when a copious supply of steam is added at the bottom of the retort, the proportion of steam to ethylene in the hot gas will be very much higher than is normally the case in carbonization, which will result in the partial decomposition of the latter. If this view is correct, one would expect that in a "continuous" vertical retort—where the ethylene is mainly evolved in the upper half of the retort and the lower half contains hot and nearly completely carbonized coke—the steam introduced would be much less likely to cause decomposition of the ethylene; for before reaching the zone in which this gas is present, it would have been largely converted into water gas by the action of the coke in the lower half of the retort. The results obtained with the Woodall-Duckham retort at Liverpool (quoted by Herr Körting), seem to confirm this supposition, as the gas there produced, while of the same calorific power as that from the five-metre Dessau retorts, had an illuminating power of 14·20 candles, compared with 10·80 candles in the latter case.

From the point of view of calorific power alone, the above decomposition of the illuminants by steam would not be entirely disadvantageous. The reactions take place with absorption of heat, so that the total volume of hydrogen and carbonic oxide produced from one volume of ethylene contains about 22 per cent. more heat units than the original ethylene—one cubic foot of ethylene with a calorific power of 1603 B.Th.U. yielding six cubic feet of hydrogen and carbonic oxide having a total calorific power of 1960 B.Th.U. The net result would, therefore, be that, although a loss in calorific power per cubic foot would ensue, there would be an increase in the total number of B.Th.U. produced. At the same time, it would be much more economical to obtain the increased volume of carbonic oxide and hydrogen by the action of steam on the cheaper coke than on the much more valuable ethylene.

Herr Körting clearly indicates his opinion—which, on the figures given, will meet with universal agreement—that where the illuminating power of the gas is still (for good or evil) an important factor, only four-metre retorts with a limited amount of steaming can be employed; and it is of interest to see how far the results obtained with these retorts seem to comply with English requirements. These are, of course, varied; but I think it may be taken as generally true that, over the greater portion of the southern half of England especially, the present demand is, or will be in the near future, for a gas having an illuminating power of 14 to 15 candles, tested in the Metropolitan No. 2 argand, and a calorific power of 550 to 580 B.Th.U.

The coals mentioned as having been used in the four-metre retorts at Dessau are apparently of much the same quality as the average of those used in the South of England; and presumably

somewhat similar results would be obtained with the same retorts at those works—viz., rather more than 11,000 cubic feet of gas per ton having an illuminating power of 17·5 to 18 candles and a calorific power of about 600 B.Th.U., which is of considerably higher quality than is required at such works, both as regards illuminating and calorific power. As it is a part of the Dessau system to employ as high a temperature of carbonization as possible, one may assume that any material increase in the make, with reduction of the quality by further increase of temperature is hardly possible in practice, and that therefore the reduction to the above-mentioned standard would have to be brought about in a different way. Two alternatives at once suggest themselves: (1) By steaming the retorts, but to a much smaller extent than is the case with the five-metre retorts; and (2) by diluting with blue water gas made in a separate plant. Judging from the illuminating power obtained with the five-metre retorts, and assuming that the decomposition of the illuminants in the manner suggested above is correct, it seems most likely that the first plan would reduce the illuminating power in much greater proportion than it would increase the make per ton, unless some change can be made in the method of introducing the steam into the retort. If, however, arrangements could be made whereby the steam is added at a number of points around the periphery of the retort during the later period of burning off, the latter might then be largely converted into water gas before it reaches the zone at which the illuminants are being produced, and the reduction in illuminating power be thus greatly diminished. The mechanical difficulties in the way of making such arrangements for the steam would, however, be considerable.

On the other hand, by the second plan, it would be possible to add some 20 per cent. of blue water gas to the hot coal gas, and obtain a yield of over 13,000 cubic feet per ton of gas of from 14 to 15 candles and 550 B.Th.U.; and with works of sufficient size to permit of the economical production of water gas in separate plant, it seems to me this plan would be the more favourable under English conditions.

Where illuminating power is of no consequence, and a high make of gas of about 550 B.Th.U. is all that is aimed at, Herr Körting is in favour of the use of five-metre retorts with copious steaming; and this opinion seems to me fully valid, so far as it relates to installations of these retorts of the size hitherto erected, with the possible exception of that at Cologne. But here again, with medium and large sized gas-works, even where the calorific power is the only important quality of the gas, I think this will by no means always be true, but that in many cases it would be more economical to employ the four-metre retort and dilute the coal gas with blue water gas made in a separate plant. As already pointed out, taking the figures given in Herr Körting's table, the addition of 20 per cent. of water gas of 300 B.Th.U. to the coal gas made in the four-metre retorts, would give results practically identical (as regards make and calorific power) with those obtained from the five-metre retorts. If anything, this statement unduly favours the five-metre retorts, as the calorific power of water gas is only taken as 300 B.Th.U., whereas Mr. Copp, in his recent Presidential Address to the Midland Gas Association (see *ante*, p. 546) states that the average calorific power of the water gas made at West Bromwich is 320 B.Th.U.

The difference in cost between the two plans: (1) Five-metre retorts with copious steaming, and (2) four-metre retorts and separate water gas plant, would lie chiefly in the following items: (*a*) capital outlay, (*b*) ground space required, (*c*) labour, (*d*) wear and tear, (*e*) fuel used, (*f*) quantity of tar and liquor produced. It is impossible at present to give any exact figures as to these points, which can only be completely ascertained by further work; but an indication may be given as to the general nature of the difference in each of these items.

With regard to (*a*), the cost of the additional metre of the five-metre retorts, and consequent greater height of building, will have to be set against the cost of the water gas plant. As to (*b*) the five-metre retorts have, according to the table, a daily output of about 15,000 cubic feet, while the four-metre retorts *plus* the added 20 per cent. of water gas will have an output of about 16,800 cubic feet per retort. This will, therefore, in the latter case, cause a diminution of retort-house space required per 1000 cubic feet by more than 10 per cent.; and as the ground space occupied by water-gas plant is relatively small, and the quantity required is only 20 per cent. of that of the coal gas, the figures of total space in each case would not differ greatly. In a similar manner, in (*c*) the increased production of mixed gas of 550 B.Th.U. per retort will correspondingly decrease the retort-house labour per 1000 cubic feet of gas made, which will largely counterbalance the labour required on the water-gas plant. As to (*d*) the extra wear and tear of the additional metre of retort has to be set against that of the water-gas plant.

With regard to the fuel used (*e*), nothing definite can be said, as no figures have been published with regard to the quantity of coke used on the four-metre and five-metre retorts, including that required for raising the steam used. No exact comparison is therefore yet possible. As, however, an additional quantity of water gas of about 2200 cubic feet is made in the five-metre retorts, a corresponding amount of coke must have been consumed for this purpose; and as the water gas reaction takes place with absorption of heat, more coke must have been used in the furnaces to maintain the temperature of the retorts, and also to raise the necessary steam. Thus the amount of coke obtained for sale must be less than that obtained from the four-metre retorts. With a water-gas plant, some 80 to 100 lbs. would be used in the production of the 2200 cubic feet of water gas; and this will have to be set against the difference between the coke obtained for sale on the four-metre and five-metre retorts respectively. So far as (*f*) is concerned, as no tar or liquor is produced by the water-gas plant, this resolves itself into a question of the comparative yields of tar and liquor from the four-metre and five-metre retorts. The experience gained with the shale retorts used in Scotland would seem to indicate that an increased yield of ammonia should be obtained by the more copious steaming; but no figures have yet been published on this point for the Dessau retorts.

Considering all these points together, it appears that as the total quantity of gas required increases, so is it likely that the balance of advantage will more and more be found to lie in the production of the water gas in a separate plant, and not in the retort itself; and, apart from the direct economy, I think there can be hardly any doubt that, in large undertakings, a uniform quality of the gas mixture would be much more readily obtained in this manner than where the admission of steam has to be regulated to a very large number of separate retorts.

PROPOSED EXTENSIONS AT PARIS GAS-WORKS.

In the "Journal" for the 18th ult., it was mentioned that the Prefect of the Seine had submitted to the Municipal Council of Paris an important scheme for the extension of the gas-works. It was first considered by the Streets Committee, who approved of it; and it was subsequently sanctioned by the Council. The following particulars in regard to the matter appeared in a recent issue of the "Journal de l'Eclairage au Gaz."

The existence in 1904 (the closing years of the old Company's management) of a reserve manufacturing power of 17 per cent., dispensed with the necessity for contemplating the introduction of additional plant. Since then, however, the increase which has taken place in the gas consumption has surpassed the anticipation of the most optimistic. Indeed, in less than two years Paris has actually regained the annual consumption of nearly 1100 million cubic feet of gas which it lost by the separation of the supply to the suburbs. For eleven months of the past year—Jan. 1 to Nov. 30—the increased consumption, as compared with the corresponding period of 1906, was about 530 million cubic feet, or 4·66 per cent.; and it was maintained during the last month. Consequently, the producing capacity of the works is no longer equal to the requirements. During 1906 and the early months of 1907, the Engineers of the Municipal Lighting Department on several occasions called the attention of the Prefect of the Seine to the necessity for taking steps to increase the capacity of the gas-works; but the uncertainty then prevailing in regard to the employment of carburetted water gas, and the fact that the gas-works were only under provisional management, caused the postponement of a decision upon the matter. When the new Paris Gas Company eventually entered into full possession (on Sept. 1), the Prefect invited them to submit to him at once a list of the works they regarded as necessary to meet demands in the winter of 1908-9 and the following years. They accordingly sent in a scheme which was examined by the officials of the Lighting Department; the result of their investigations being that all the works proposed were regarded as being urgent. They considered that some should be carried out at once; while others, intended to provide for the service until 1912 at least, ought to be commenced almost simultaneously. The Prefect thereupon formulated a scheme, of which the following are the main outlines.

The construction at the Landy works of two retort-houses, each equal to the production of 232,000 cubic metres (about 8,200,000 cubic feet) of gas daily; being an increase of 30 per cent. on the present output. The erection of one retort-house is to be commenced at once, so as to be partially ready for work next winter, and be fully equipped for that of the year 1909-10. The second retort-house, to be commenced this year, could be partly finished in 1909. In this way, the first requirements of next winter will be provided for. The construction of these retort-houses will comprise all the latest improvements—*i.e.*, horizontal through retorts, 20 feet long, and drawing and charging machines. There are also to be two telescopic gasholders, each of 9 million cubic feet capacity. The cost of the two retort-houses, with the plant and adjuncts, is put at 28,856,000 frs. (£1,154,240). A further sum of 3,000,000 frs. (£120,000) will be needed for mains to convey the gas to Paris.

Owing to the increased use of sulphurous coal, it is essentia to augment the purifying plant. The scheme submitted by the Company comprised extensions at all the works at a cost of some 2,000,000 frs. (£80,000). The Lighting Department, however, considered it advisable to restrict the scheme to the really urgent extensions, more especially in view of the fact that the Vaugirard, St. Mandé, Passy, Boulogne, and Maisons Alfort stations might eventually be transferred to other hands. These five works were accordingly left out of consideration; and consequently the estimate was reduced by 400,000 frs. (£16,000).

The other projected improvements comprise the installation of coal and coke conveying plant and the transformation into

regenerative furnaces of the old furnaces at La Villette works, at a cost of 5,600,000 frs. (£224,000). These changes will, it is expected, effect an annual saving of about 720,000 frs. (£28,800) in the expenses for coke and labour. The work is estimated to cost 3,000,000 frs. (£120,000). Some modifications are to be made in the products works at La Villette station, at a cost of 300,000 frs. (£12,000). Obsolete plant for the manufacture of sulphate of ammonia is to be replaced by apparatus of more modern type, by which considerable economy in the cost of labour will be realized. A similar result is anticipated from an alteration of the plant in the tar-works, on which it is proposed to spend 800,000 frs. (£32,000). An outlay of a like sum on the extension of the wharf at Clichy will allow of a saving of about 120,000 frs. (£4800) per annum, by enabling a larger quantity of coal to be delivered by water. The construction of a wharf at Le Landy, to connect this station with the St. Seine Canal, and thus avoid carting about half the coal required there, would necessitate an expenditure which is put down at 2,500,000 frs. (£100,000); and a sum of 500,000 frs. (£20,000) is required for labour-saving machinery in the coke-yards.

The various works contemplated will involve an outlay of 47,000,000 frs. (£1,880,000) in round numbers; and the Prefect of the Seine proposes to meet this expenditure partly by utilizing two sums of 3,500,000 frs. and 1,000,000 frs. outstanding in connection with the transfer of the works of the late Company, and the unexpended balances, amounting respectively to 3,028,371 frs. and 1,102,303 frs., of the two loans for gas purposes raised in 1905 and 1906. These various sums make a total of 8,630,674 frs. (£345,227), which it is thought may be brought up to the round figure of 9,000,000 frs. (£360,000). Consequently, 38,000,000 frs. (£1,520,000) will have to be raised by loan so as to make up the 47,000,000 frs. required; and the Prefect suggests for its repayment a period of thirty years from 1911, which date would correspond with the completion of the works for which the money would have been obtained.

ARCHITECTURAL PRINCIPLES AND LIGHTING PRACTICE.

THE "Illuminating Engineering Society" includes among its members men of varied vocations—gas engineers, electricians, architects, oculists, and others—directly or indirectly concerned with the general problem of illumination. It is to be expected that, with such a variety of interests, information on every possible phase of the subject is easily procurable; and the Society is therefore in a happy position for the free elucidation of knotty points. At the same time, it is equally to be expected that the points of view of the several professions represented will at times differ considerably, and thus provide conflicting elements with debates quite as "illuminating" as the subjects discussed. An instance of the kind is found in the Society's "Transactions" for January, which include a paper contributed by Mr. Bassett Jones to the proceedings of the New York Section.

There has been a more or less persistent feeling on the part of lighting specialists that many architects, and most builders, fail to adequately consider matters of illumination when their buildings are in the plan stage, and that the question of light and light distribution are only thought of after the work has been well started. In view of this feeling, it is interesting to find that architects (or at least some architects) on their side, regard lighting experts as hopelessly astray in another direction—that of knowing what is fit and proper for the building which they have been at such pains to design. This aspect is disclosed by the paper here referred to, and more particularly by the debate which followed. Mr. Jones's contribution is entitled "The Relation of Architectural Principles to Illuminating Engineering Practice." It discusses at length the nature of the "æsthetic," and the sense of beauty, and deals also with their relation to the principles of architecture.

Having pointed out the underlying principles of true architecture, the author seeks to impress upon those concerned with the illumination of any building the necessity of being in sympathy with its æsthetic qualities; and he suggests that any illuminating engineer who considers only the scientifically practical side of his work is necessarily doomed to ultimate failure. Mr. Jones therefore thinks that a very important feature of the engineer's education is the study of the history of illumination and its relation to architectural practice. It is argued that the architect, in his conception of the building design, has also in view the tone, intensity, and quality of the lighting; and it is this ideal illumination that the engineer must seek to realize—looking at it not merely as a lighting specialist, but through the eyes of the architect. The engineer must be able to discern where direct and indirect illumination are required, and the kind of fixtures associated historically and æsthetically with the general architectural design by means of which the proper results are to be obtained.

The illuminating engineer cannot successfully cope with his problem, and advise with the architect as to the best means of achieving results, unless he is able to appreciate and understand the latter's view point. He must therefore be familiar with architecture, and particularly with the use of colour in decoration, since the æsthetic value of colour arrangements depends upon extreme nicety of contrast; and this is susceptible to variations in the tone and intensity of light. In the paper the author deals mainly with classic examples, and gives, as instances where fixtures are in keeping with surroundings the handsome pendants in the Salon des Gardes, Fontainebleau, and the Salle à Manger, Grand Trianon. These fixtures, both in proportion and design, are in harmony with the respective rooms; and although the distribution of light therefrom may not be perfect from the engineer's standpoint, the illumination must be considered good, because no other scheme is possible without marring the effect. This is virtually the author's contention throughout the paper—that "illuminating engineering is not a matter of light distribution—it is a matter of suitable lighting; and the conditions determining what is suitable are just as different as any two designs are different." In his reply to the discussion, Mr. Jones goes further, and says that "mere convenience and mechanical or electrical perfection must submit themselves to the requirement of suitability in lighting." A lighting fixture, for instance, is imperfectly useful unless appropriate to its surroundings.

In buildings of any artistic pretension, engineering is regarded as quite a secondary consideration; and the engineer must be satisfied to achieve the results required without any preconceived notions of scientific light distribution. It is in this matter that the author considers there should be co-operation between the architect and the illuminating engineer; but he adds that the latter must be ready to take his properly subordinate place and receive the data which the former can alone furnish. Mr. Jones disclaims holding a brief for the architectural profession. He says that the majority of architects do not conceive their designs at all—they draw them; and thus they share with the engineer a vast inadequacy of education. If the architect cannot direct the engineer, the latter must direct himself; hence the author pleads for a study of architectural principles.

It can be easily understood that, in a mixed professional audience, the subject, as treated by Mr. Jones, elicited a good deal of criticism. The Chairman (Mr. E. L. Elliott) was ready to agree that, whatever the importance attached to mathematical engineering, no system of illumination could be called a success which was ugly or offensive to the æsthetic taste. Those members of the Society representing the architectural profession naturally took the same view as the author. "As an architect," says one, "I feel very strongly inclined fo state that the architect is best fitted to cope with the problem of illuminating buildings erected on historic principles, leaving modern places, such as offices, shops, and the like, to the illuminating engineer. For lighting the first class of building, the engineer, by reason of his education, is unsuited, since, having no conception of the effects desired, and possessing neither creative ability nor knowledge of the history of architecture and ornamentation, he is working in the dark." Another member, following on the same side, suggested that the curse of the engineering profession was the inbred belief that efficiency was the only thing that counted—an idea further developed by a later statement that in buildings having architectural pretensions economy must give precedence to the æsthetic.

The lighting profession were able, however, to hold their own. Ready to admit that for certain buildings the artistic requirements were of primary importance, they were not disposed to agree that good and skilled illuminating engineering necessarily sacrificed the architect's ideas. It was pointed out that while the design of a fixture should make it a thing pleasant to behold, no amount of grace and ornament could overcome the feeling of dissatisfaction if the lighting was bad. "Good illumination, in its broad sense, must conform not only with the canons of art, but also with those of science." This was said by Mr. L. B. Marks in reply to the author's suggestion that *ipso facto* artistic illumination was good illumination.

A point was made by one speaker in the remark that if it was advisable for the illuminating engineer to know something of architecture, it was equally necessary for the architect to be acquainted with the fundamentals of lighting practice. Architects give a great deal of thought to the question of daylight, and very little to artificial illumination.

Mr. E. L. Elliott poured oil on troubled waters by referring to the laws of neutrality, which made it possible for architects and illuminating engineers to meet on common ground. The artificial lighting of a building is primarily utilitarian, and belongs to the engineer; but the methods and apparatus, being subjects for decoration, present a phase which falls within the province of the architect. The most highly artistic effects are not incompatible with the best engineering practice; but this result can only be obtained by the mutual co-operation of architect and engineer, founded on reasonable appreciation of each other's point of view.

Companies Promoted in 1907.—Some interesting returns on company registrations during last year were given in a recent issue of the "Investors' Guardian and Joint-Stock Companies' Review." There was an unprecedented increase of 414 in the number of companies registered, compared with 1906, the previous year—the figures being 4395 and 4809 respectively. But the capital of the registrations was only £145,000,000 last year, against £285,000,000 in 1896. The capital raised in connection with the supply of gas was £670,975 in 1906 and £1,236,840 in 1907. For water, however, much less money was invested; the figures being £1,226,509 in 1906 and £140,000 last year.

THE RELATIVE HYGIENIC VALUES OF GAS AND ELECTRIC LIGHTING.

By Dr. Samuel Rideal, F.I.C.

(*Concluded from p.* 614.)

The carbonic acid produced by human respiration was estimated by calculation from the proportion of carbonic acid in the air of the room and the ventilation figures. The probable accuracy of the estimation by this method is that the results should be within 5 per cent. of the truth. These estimations disclosed rapid changes in the ventilation rate, and that these changes were closely connected with changes in the difference between the temperatures of the room and of the outside air.

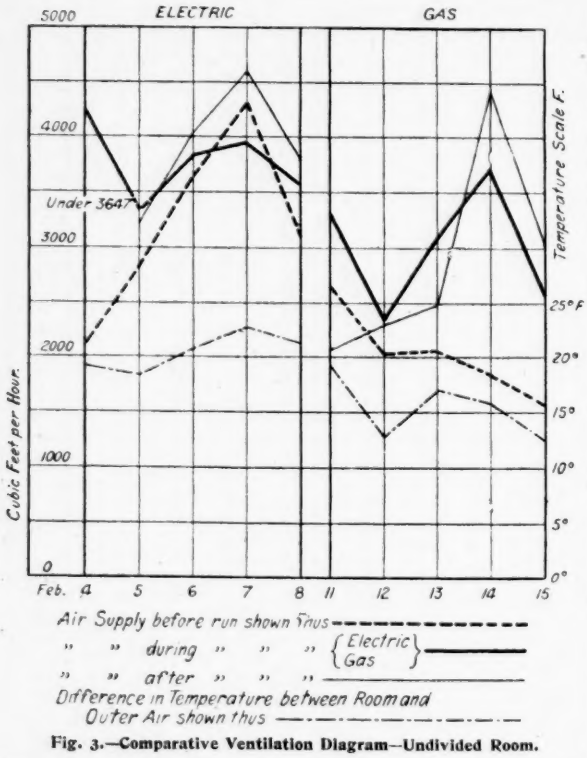


Fig. 3.—Comparative Ventilation Diagram—Undivided Room.

The diagram reproduced in fig. 3 shows the relation between temperature and ventilation for one period in which gas was used, and one in which the lighting was by electricity. From the data obtained in this manner, the figure that has been already named —viz., 0·8 cubic foot per head—was arrived at for the average hourly production of carbonic acid by human beings. The rate of ventilation found under certain conditions was as follows:—

Conditions.	Lighting.	Cubic Feet of Air per Hour during Observations.	Vols. of Carbonic Acid per 10,000, after Stable Conditions had been Reached.
Undivided room—			
Fire-places and ventilators closed	Gas	3579	29·5
" " " "	Electric	3492	22·6
Divided room—			
Fire-places and ventilators closed	Gas	2002	41·1
" " " "	Electric	1950	31·1
" " " open	Gas	5078	19·4
" " " "	Electric	3748	19·3

The actual ventilation during the period devoted to the observations was therefore greater with gas than with electricity. As compared with the ventilation prior to that period, there was in the undivided room an increase of 20 per cent. when electricity was the illuminant, and of 38 per cent. when gas was used. The following are actual figures for two evenings when the conditions were otherwise comparable.

Illuminant.	Ventilation.			Persons Present.	Vols. of Carbonic Acid per 10,000.
	Initial.	Final.	Mean.		
Gas	3420	2880	3150	7·0	23·5
Electricity . .	2860	3340	3100	7·0	20·4

After gas had been burnt continuously for twelve hours in one of the (divided) rooms, the proportion of carbonic acid in the air remained steady, and averaged for both rooms and a number of days 11·2 volumes per 10,000 above the outside air. On occupying this room for the observations, and the similar electrically lighted room, there was, on the average, an excess of 3·83 volumes only in the gas-lighted over the electrically-lighted room, or only a third of the excess which the gas should apparently have produced. Thus the ventilation was much better relatively in the gas-lighted room. Owing to the massive walls of the rooms, and the blocking of the fire-places and ventilators, the ventilation was feeble compared with that of an ordinary dwelling room. The hourly air supply only reached half the capacity of the room; whereas it would be considerably greater in ordinary rooms in which the ventilating action of the gas-burners would, therefore, be more striking. The author's tests of the proportion of carbonic acid in the air at different levels tended to show that the composition of the air is virtually uniform at all levels above 4 feet from the floor.

The influence of temperature and humidity on individuals is next dealt with. A number of authorities are quoted in support of the view that the oppressive condition of the air of a badly-ventilated room and the concomitant unpleasant sensations are due rather to high temperature and humidity than to any organic contamination. The author then describes the experiments on temperature and humidity effects he carried out as part of the present investigation. A horizontal line of thermometers placed 12 inches apart showed that at the same level there was normally only about 1° difference in the temperature near the walls and at the centre of the room; the centre being the higher. Readings of a vertical chain of thermometers showed that the temperature of the room rose and fell as a whole. The heat appeared to be distributed by convection currents rather than by conduction. The air in the centre of the room, being warmed by the lights and occupants, rose to the ceiling and spread outwards to the walls, down which it fell, with loss of heat to them every moment.

Heat was thus shown to be a chief agent in promoting ventilation; and the heat generated was about 20 per cent. greater when the lighting was by gas than when by electricity. The heat of the room, unlike the proportion of carbonic acid, seldom reached a steady state in an evening—owing doubtless to the heat being conducted away by the walls. On the average, only about 28 per cent. of the total heat lost from the room was carried off by the outgoing air, while the remainder passed away by conduction and radiation. There were wide departures from these proportions, however, on different occasions, owing to variations in the prevailing conditions of air supply and temperature. When the conditions were alike, the average rise in temperature of the room was the same—within half-a-degree—for gas lighting and electricity. Thus, notwithstanding the larger output of heat from the gas-burners, the ultimate heating effect of gas and electric lighting is the same—probably owing to the ventilating action of the currents of air set up by the gas-flames. The air current that is set up by the electric lamps is less brisk, and hence their heat is not so rapidly dissipated. Notwithstanding restricted ventilation and prolonged occupation, the temperature of the rooms rose only to a very small extent—about 3° to 4°. Hence it may be concluded that the heat question is virtually eliminated with modern lighting—*i.e.*, with gas as well as electricity.

The humidity was determined in the investigations by wet and dry bulb thermometers. An attempt was made to determine the absolute amount of moisture per cubic foot by a modification of Haldane's air-analysis apparatus; strong sulphuric acid being the absorbent, and the control tube being used dry. It was found, however, that, probably owing to the moisture clinging tenaciously to the walls of the burette, complete absorption was only attained by eight or ten transferences of the air between the burette and the absorption pipette. The determination thus became somewhat tedious (as compared with the determination of carbonic acid); and the use of the method was not pursued. The rooms were generally from 4 to 10 per cent. drier than the outer air at the beginning of the evening; but this difference became materially reduced as the evening advanced. When there were fires in the rooms, however, an initially low humidity became reduced by 6 per cent. with gas, and by 5 per cent. with electric lighting. Throughout, there was close agreement between the results with the two illuminants, showing that their nature really played a very small part in determining the condition of the air of the room. The wall surfaces and the air of a room are continually exchanging moisture; and by this exchange the humidity of the air is maintained approximately constant. A number of experiments were made with an artificially humidified atmosphere, and with specially dried air, with a view to observing whether any discomfort was caused thereby to the occupants of the rooms; but the results had no direct relation to the nature of the illuminant in use at the time.

The author next discusses the effect of organic matter in the air on the occupants of rooms. The breath has been asserted to contain volatile organic substances injurious to health; and the amount of respirated carbonic acid in the air has been taken as a measure of these substances. Attempts have been made to estimate them by their reducing action on solutions of potassium permanganate; and a number of such estimations were made in the course of the present researches. The sulphur dioxide evolved from the gas under the prevailing conditions should be a negligible

quantity. From the results obtained, it appears that the reduction of permanganate increases in an electrically-lighted room when people are present—presumably owing to a product of respiration—but that it likewise has a high and fairly constant value when there is a continuous burning of gas in a room in which there are no people. Hence there must be in a gas-lighted room two kinds of matter which reduce permanganate. The reduction of permanganate reaches a stationary value at about the same time as the carbonic acid reaches a stationary equilibrium value. With no gas burning, the volumes of oxygen used up per million volumes of air increased in the period of observation on the average from 4 to 9·8, or by 5·8; while with gas burning, the increase was from 5·3 to 9, or only 3·7. It may therefore be inferred that gas lighting decreases the organic contents of the air of a room, owing to the incinerating action of the gas-flame. As some of the respiration products are probably nitrogenous, an attempt was made to determine directly the total organic nitrogen in the air; but the investigation was brought to an end before a satisfactory determination had been made.

The air of the rooms was examined from time to time by Nicloux's test for carbonic oxide, and was found to contain on the average 2·30 volumes per million of air when electric lighting was used, and 2·52 volumes when gas was used—*i.e.*, a practically equal trace under the two illuminants. Nicloux's test consists in taking up with chloroform the iodine liberated by the carbonic oxide from iodic anhydride, and matching the tint with that obtained from a standard solution of potassium iodide. Later, leaks of gas were purposely arranged in imitation of the leakages which might happen from gas-fittings, and observation was kept on the occupants of the room. On one occasion, gas was allowed to escape for fourteen hours into one room at the rate of 0·12 cubic foot per hour, and 5·8 volumes of carbonic oxide per million were found in the air of the room. The ventilation of the room was taken at 2000 cubic feet per hour. On another occasion, after a leak at the rate of 0·6 cubic foot per hour in the same room for eighteen hours, 9·1 volumes of carbonic oxide per million were found. The ventilation was equal to 1830 cubic feet per hour. The rate of leakage was then increased to 8·8 cubic feet of gas per hour, and after some three hours there were found to be 24 volumes of carbonic oxide per million in the air of the room. Three subjects remained in the room, and were examined medically at intervals. No serious symptoms appeared. One subject was merely inconvenienced by pulsation in the temples. The other two were more affected; they displayed a considerable rise in their respiration. There was a well-marked relative increase in the coloured corpuscles of the blood, and a slight rise in the pulse rate. All lost, after a time, their sense of smelling gas in the room, though those outside the door described the smell as very strong. It may be inferred from this trial that there is no fear of any immediate danger to health from the quantity of gas likely to escape from an ordinary leakage.

The bacterial content of the air of a room is more likely to be reduced by gas than by electric lighting, because of (1) the cremation of organisms in the gas-flames, (2) the sterilizing effects of the sulphur acids from the gas, (3) the removal of organisms by the greater condensation on cold surfaces, and (4) the increased ventilation of the room. The temperature of an electric glow lamp is sufficiently high to destroy most living germs which come in contact with the globe. On the other hand the heat of the two gas-flames in the room would suffice to raise 120 cubic feet of air per hour 420° Fahr., or 324 cubic feet to the boiling point of water. This calculation assumes that only two-thirds of the total heat of the gas is available for heating the air; the remaining third being possibly carried off by radiation and conduction. Plates of nutrient gelatine were exposed in the rooms, and the cultures were incubated for 7 days at 20°C. There was a reduction in the number of organisms per square foot, whether the lighting was by means of gas or electricity; but the reduction proved to be greater with the former illuminant. Some of the diminution in both cases must be ascribed to the bacterial purification of the air of a room, which Haldane has observed is effected by the lungs of inmates. Estimations of the organisms in suspension in the air of the rooms were attempted by drawing a known volume of air through either a small sugar filter or through a glass tube coated inside with nutrient gelatine; but they were not numerous enough to admit of a satisfactory average being struck. The condition of the water condensed on cooled glass globes when suspended 3 feet below the ceiling was determined three times each for gas and electric light. The results showed there was a destruction of germs by the moisture condensed from the products of gas-flames, probably due to the germicidal action of the traces of sulphur acids in the condensed water. No such destruction of germs occurred through the condensed moisture when the lighting was by electricity.

Further research, on strictly physiological lines, would be required to furnish an answer fully to the question whether, physiologically, there is any choice between gas and electricity as illuminants. Owing to the comparatively wide range of activity of the different organs, and their power of accommodation to varying conditions, the incidence of discomfort and disease is kept in abeyance until the limits of the compensating action of the organs are passed. In perfect health, however, the organs should be at their mean activity, and it seemed possible by observing (1) the pulse, (2) the respiration, and (3) the arterial pressure, to obtain some information as to the physiological effect of the two modes of lighting.

The pulse rate fell in the course of the evenings under both systems of illumination, and actually a very slightly lower rate was reached under electric light than under gas. But it was fairly conclusively established that the mode of lighting had practically no influence on the rate of pulse. The respiration rate also fell, on the average, in the periods of observation; but the fall was slightly greater under gas light. The observations of the form and rate of movement (or "tone") of the blood pressures, made with the sphygmograph, indicate, so far as they go, a greater rise in the arterial tone having taken place under gas light. They point, however, to further investigation being advisable. The "tension" of the blood pressures was observed by Oliver's haemomanometer. The difference between the diastolic or lower, and the systolic or higher, pressure in the arteries appeared to increase somewhat under gas light in the undivided room; but after the room had been divided, there was no marked difference in the readings under the two modes of lighting. The number of corpuscles in unit-volume of the blood was ascertained by a haemo-cytometer; but taking other factors into account, the experiments did not disclose that either illuminant *per se* affected the corpuscular quality of the blood.

Temperatures, taken in the mouth, were recorded; but the results showed that there was no difference on the body temperature between gas and electric lighting under the conditions of these investigations. With both systems of lighting, the temperature and humidity of the air of the rooms were maintained well below the limit at which objective evidence is afforded of harmful effect. Body weights were carefully taken; and the mean average loss was found to be practically the same for the two illuminants. Mental fatigue was tested by the setting of sums at the beginning and at the end of each evening's investigation. There appeared to be less mental fatigue, on the whole, in the gas-lighted room. An attempt was made to ascertain whether either mode of lighting affected the air to the olfactory sense, by taking the opinion of persons who entered the room after one or other light had been in use for from three to twelve hours previously. These persons had no information as to which light had been used—both lights having been turned on when they were about to enter the room. It appeared from the opinions given that under the two systems of lighting there was no difference in the air of the room sufficient to affect with certainty so delicate a sense as smell. The interval required for muscle to respond to will-force was tested by a time reaction apparatus; but there appeared to be no appreciable difference under gas and electric lighting.

The effect on the eye of the two modes of lighting was carefully investigated, though it was found necessary to limit the inquiry to tests of eye fatigue. A more extended inquiry—covering a determination of the variation in the power of judging and of comparing colours—would, the author remarks, be of the utmost utility, since such considerations must often govern the choice of illuminant. Eye fatigue of four different kinds was investigated by a series of tests as follows: (1) Perception test; being the difference found in visual acuity, on Snellin's types at a distance of 6 metres, before and after three hours under each illuminant. (2) Accommodative or ciliary muscle test, which recorded the *punctum proximum* with the standard type before and after the three hours. (3) Orbicular muscle test, or amplitude of convergence, ascertained by noting the strongest prisms that could be overcome. (4) Retinal test; being the difference in light perception after three hours under each illuminant, as measured by the number of opal glasses of 1 lb. to the square foot through which light from a standard candle at 1 metre from the eye could be observed. All the ophthalmic results obtained are comparable for the two systems of lighting, but have no general significance or absolute value. The tests showed that the sensitiveness of the eye to light, as measured by the perception test, diminished markedly under the electric light, but not at all under gas light. The orbicular muscle tests showed that the power of co-ordinating and using the motor muscles of the eyeball diminished to a greater extent under electric than under gas light. The ciliary muscles of the eye also were proved to be more accommodative after three hours' gas lighting than after the same period of electric lighting. The retinal test also showed that the optic nerve or centre remained more susceptible when gas was the illuminant. Thus gas had the advantage under all the tests; and all the results pointed strongly to the conclusion that, as used in these rooms, gas lighting was less fatiguing to the eye than electric lighting. The results were of a consistent character.

General Conclusions.

In reviewing the whole investigation, it is important to bear in mind that the rooms used were more nearly air-tight than ordinary living rooms, so that any effects of the lighting were accentuated by the restricted ventilation. Yet the ventilating action of the gas-burners was competent to carry off products equivalent to the products of the burners; so that the composition of the air remained practically identical under the two illuminants. This being so, it is not surprising that no difference could be generally detected in the physiological effects. The whole of the facts conduce unreservedly to the conclusion that there is nothing in either mode of lighting which is incompatible with the best hygienic conditions.

The following is a summary of Dr. Rideal's main conclusions from the investigation :—

(1) The products of combustion of gas, owing to the better

ventilation which it affords, are not found in the air in anything like the proportion which might be expected; and the temperature and humidity in an occupied room are no greater with gas lighting than with electric lighting.

(2) Carbonic acid *per se* in the air has not the injurious effect once ascribed to it; but a prejudicial effect is exercised on inmates by considerable increases in temperature and humidity, from whatever source arising. But even under the restricted ventilation and crowding which prevailed under the conditions of this investigation, neither the temperature nor the humidity of the air reached a point at which it had any prejudicial effect, as indicated by recognized physiological tests.

(3) The products—viz., heat, carbonic acid, and moisture—have been shown to be derived more from the inmates than from the illuminant. Thus a room of moderate size can be efficiently lighted by gas without the amount of these three products being sensibly affected.

(4) With present methods of construction (and without reference to large public rooms) adequate ventilation of domestic rooms is better ensured the smaller the room.

(5) The medical observations, as well as the chemical and physical data obtained, demonstrate that the choice between gas and the electric light does not depend on hygienic considerations.

AMERICAN STREET LIGHTING STATISTICS.

THE "American Gaslight Journal" for the 2nd inst. contains some tabulated statistics, specially compiled for our contemporary by Mr. H. Thurston Owens, from two Bulletins issued by the Department of Labour—for 1901 and 1905 respectively—in regard to the public lighting of cities containing populations of more than 30,000 persons. In the earlier Bulletin, 134 cities were dealt with; and in the later one, 154. The writer points out that in 1901 there were almost as many cities using oil-lamps as there were using Welsbach burners; while in 1905 (in which total there are 20 more cities) there were nearly four times the number of Welsbach burners that there were of oil-lamps. The number of people using open-flame gas-burners was nearly twice that of the users of Welsbachs in 1901; but these figures were practically reversed in 1905. Incandescent electric lamps gained one more city than Welsbach burners during the four years. Electric arcs show a gain of about 20 for each city added; while open-flame gas-lamps show a loss of 22. The number of cities using the various lamps is given in Table I. Electric arcs, incandescents, and Welsbach gas-lamps are steadily increasing, and vapour lamps are holding their own; while the open-flame gas and oil lamps show a loss of 50 per cent. in popularity.

Comparing the actual figures in the cities, it is seen that there is a gain of 73,425 lamps, as shown in Table II. The significant features of this table are that in 1901 there were actually more vapour lamps in use than there were Welsbach burners, and that the total number of electric lamps equalled the open-flame gas-burner. Though the Welsbachs showed a gain of more than 76,000 lamps, there was a loss in open-flame burners of 52,625 lamps; so that the electric lamps showed a total increase which was double that of gas.

TABLE I.—*Number of Cities Using Various Lamps.*

No. of Cities.	Electric.		Gas.		Vapour.	Oil.	Total.
	Arc.	Incandescent.	Welsbach.	Other.			
1901—134	134	44	28	50	28	21	..
1905—154	154	62	45	28	31	12	..
Inc.	20	18	17	..	3	..	..
Dec.	..	..	..	22	..	9	..

TABLE II.—*Number of Lamps in Use in all Cities of Over* 30,000 *Population.*

No. of Cities.	Electric.		Gas.		Vapour.	Oil.	Total.
	Arc.	Incandescent.	Welsbach.	Other.			
1901—134	103,717	20,455	43,588	124,602	43,955	4,524	340,841
1905—154	140,044	32,996	119,812	71,977	47,012	2,425	414,266
Inc.	36,327	12,541	76,224	..	3,057	..	73,425
Dec.	..	..	..	52,625	..	2,099	..

TABLE III.—*Percentage of Number in Use in all Cities Over* 30,000 *Population.*

No. of Cities.	Electric.		Gas.		Vapour.	Oil.	Total.
	Arc.	Incandescent.	Welsbach.	Other.			
1901—134	30	6	13	37	12	1·3	..
1905—154	34	8	29	17	11	0·6	..

TABLE IV.—*Number of Cities Using the Various Styles.*

No. of Cities.	Electric.		Gas.		Vapour.	Oil.	Total.
	Arc.	Incandescent.	Welsbach.	Other.			
1901—134	134	44	28	50	28	21	..
1905—134	134	55	44	26	30	11	..
Inc.	..	11	16	..	2	..	..
Dec.	..	..	..	24	..	10	..

TABLE V.—*Number of Lamps in Use in* 134 *Cities.*

—	Electric.		Gas.		Vapour.	Oil.	Total.
	Arc.	Incandescent.	Welsbach.	Other.			
1901	103,717	20,455	43,588	124,602	43,955	4,524	340,841
1905	134,357	31,242	119,645	71,694	46,778	2,395	406,111
Inc.	30,640	10,787	76,057	..	2,823	..	65,270
Dec.	..	..	..	52,908	..	2,129	..

The percentage of the number of lamps in use in all cities included in the two reports is found in Table III., which shows very plainly the marvellous increase in Welsbachs in the four years—from 13 per cent. in 1901 to 29 per cent. in 1905. The writer ventures to predict that electric arcs will no longer be No. 1 on the list when the figures for 1906 appear.

Neglecting the 20 cities which were included in the later report, we have direct comparisons of the original 134 cities as shown in Table IV. One feature of this table which should not be overlooked by gas managers is the number of cities taking up electric incandescent lamps. It is explained that in a great many cases it means spectacular lighting; but gas-lamps are equally well adapted for the purpose.

The actual number of lamps in use in the original 134 cities for both years is shown in Table V. The 20 cities which were added to the report of 1905 were all among the smaller ones in size, and only reported 8155 lamps, mostly electric; so that the increase of Welsbach lamps is still more striking here. In general, the figures for these cities show a similar result to those given in Table II. The only style of lamp that is employed exclusively is the arc; but the tendency to use more than one type increases, as of the 134 cities 43 used arcs exclusively in 1901, against 36 in 1905.

From the figures, and from the writer's observation, one essential of good street lighting is lacking, and that is uniformity, both as regards illuminants and fittings. The interest in better street illumination is not confined to any one section of the country, however; and progress is being made along the lines of the best practice of illuminating engineering.

Pittsburg, Denver, Allegheny, and Los Angeles were among the large cities having only one style of lamp in 1901, but more than one in 1905. New Orleans, Detroit, and Toledo report only arc lamps in use for both years. Syracuse and Portland abandoned oil and incandescent electric lamps respectively by 1905; so that they now report only arcs. No city showed a decrease of arcs; and there were large increases in Chicago, Cleveland, San Francisco, Cincinnati, Detroit, and Columbus. The use of incandescent electric lamps increased largely in Washington, Columbus, Los Angeles, Lowell, and Nashville; while they were abandoned in Baltimore and Portland.

No city showed a decrease of Welsbach gas-lamps, and there were many important installations. Those in which the greatest number of lamps were involved were on account of changing from open-flame burners, notably in New York City, Chicago, Cleveland, San Francisco, Cincinnati, Milwaukee, Minneapolis, and St. Paul. The large cities which showed increases in open-flame gas-lamps were Philadelphia, Washington, Newark, and Kansas City; while the following abandoned all of theirs: St. Louis, Cleveland, San Francisco, Milwaukee, Jersey City, Minneapolis, Indianapolis, and St. Paul.

With regard to vapour-lamps, Pittsburg, Jersey City, and Minneopolis installed new ones; while Cincinnati, Kansas City, Omaha, and Lowell abandoned theirs. Kansas was the only city to instal new oil-lamps; while Jersey City and Columbus abandoned theirs.

Manchester and District Junior Gas Association.—At the meeting of the Association next Saturday, Mr. J. E. Dudley, of the Higginshaw Gas-Works, Oldham, will read a paper on "Retort-House Experiences."

The Opposition to the Coal Bill.—At the meeting to be held in the Cannon Street Hotel this afternoon to protest against the Mines (Eight Hours) Bill, Lord Newton will preside, and speeches will be made by Sir John Ellerman, representing shipping, Sir George Livesey, on behalf of the gas industry, Mr. Charles Charleton, Chairman of the London Chamber of Commerce, Mr. L. A. Martin, Chairman of the London Waterside Manufacturers' Association, and Mr. G. E. Raine, representing the Coal Consumers' Defence League.

SOUTHERN DISTRICT GAS ASSOCIATION.

The Annual Meeting of the Association was held last Thursday at the Hotel Cecil. There was a representative attendance when the retiring PRESIDENT (Mr. Harold W. Woodall, of Bournemouth) took the chair. A little formal business was transacted before Mr. NORTON H. HUMPHRYS, of Salisbury, succeeded to the position.

On the suggestion of the PRESIDENT, the minutes of the last meeting were first confirmed.

ANNUAL REPORT.

On the motion of Mr. D. T. LIVESEY (East Grinstead), seconded by Mr. JAMES TERRACE (Tottenham), the report of the Committee was taken as read. It outlined the proceedings of the past year, mentioning the Presidential Address at the annual meeting, and following with an account of the highly interesting visit—interesting both from the technical and social points of view—paid to Bournemouth in the summer. The report stated that this was one of the most instructive and enjoyable summer meetings recorded in the history of the Association. To this it must be added that the members were especially gratified at the warmth of the welcome and the personal courtesy and attention shown to them throughout a long day by the Chairman of the Bournemouth Gas and Water Company and his co-Directors. Reference followed to the papers read at the autumn meeting; and then the report concluded:

Seven names have been added to the roll of membership, one has been reinstated, three members have resigned, one has become disqualified, and one (Mr. W. P. Hotchkin, of Coggeshall) has passed away—leaving a total of 170 members, compared with 167 at the end of 1906.

The balance standing to the credit of the Association at the beginning of the year was £95 1s. The receipts amounted to £87 3s., and the expenditure to £86 0s. 9d.; leaving a balance of £96 3s. 3d. to carry forward. The usual copies of the "Reports of Gas Associations" were presented to members; and these absorbed a sum of £41.

The Committee feel that the best thanks of the members are due to the President and the Hon. Secretary for their services to the Association during the past year.

NEW MEMBERS.

The HON. SECRETARY (Mr. A. F. Browne, of the Vauxhall works of the South Metropolitan Gas Company) brought before the meeting the names of two new candidates for membership—Mr. C. Chambers, of Harrow, and Mr. W. Fielden, of Staines.

On the proposition of Mr. J. TYSOE (East Greenwich), seconded by Mr. F. SMALLBONE (Woodford), these gentlemen were duly elected.

THE NEW AND OUTGOING PRESIDENTS.

The PRESIDENT said it became his duty to vacate the presidential chair; and this would not be pleasant if it did not include the duty of introducing to the members their new President (Mr. Norton H. Humphrys). They all knew Mr. Humphrys well, and had benefited from time to time by his communications to the Technical Press. In him they would have an excellent President, and, as an Association, a most instructive and useful year under his control. He (Mr. Woodall) had much pleasure in asking Mr. Humphrys to take the chair.

Amid applause, Mr. HUMPHRYS entered his new office.

Mr. W. D. CHILD (Romford) said he had been asked to propose a vote of thanks to the retiring President for presiding so ably over their proceedings during the past twelve months. Every member believed the Association had been highly honoured by Mr. Woodall's presidency. He had been exceptionally placed in his capacity as an engineer in having to build completely new works. He had availed himself thoroughly of that opportunity; and during the year he had given the members the pleasure of seeing what could be done with modern engineering ideas. In his new works, their late President had not hesitated to utilize what they, as gas engineers and managers, looked upon as the competitor of gas, and had largely employed it in his works. He was called upon to use it for one purpose; and this led him to extend the use of the electric motor to things that had hitherto been driven by steam or gas—such as exhausters. At all events, there was much to see at the works Mr. Woodall had designed, and much that was of special benefit to anyone who had the privilege of inspecting them. He was also most hospitable in the way he treated the members who visited Bournemouth; and he was deserving of the thanks of the Association for what he had done for them during the time he had held office.

Mr. A. E. BROADBERRY (Tottenham) remarked that it was his pleasure to second the vote of thanks to the retiring President. Having himself occupied the chair of the Association, he knew the amount of anxious thought that it entailed upon the President during his year of office; and while endorsing all that Mr. Child had said, he would add the congratulations of the members to Mr. Woodall for the very successful and instructive year that the Association had had during his presidency.

The PRESIDENT, in putting the motion, said he was sure it was one that did not need any further commendation on his part. They had had a most enjoyable and instructive year; and he (the President) was sure the members would wish to convey to Mr. Woodall their best thanks for what he had done on behalf of the Association.

The motion was heartily agreed to.

Mr. WOODALL, in responding, said he had to thank the members very much for the kind way in which they had accepted the high praise that had been accorded to him by Mr. Child, by Mr. Broadberry, and by the President. It was with considerable hesitation that he accepted the office of President, as he felt it was a very responsible position, and he doubted his ability to perform the duties attaching to it. For the fact that the year had not been particularly lacking so far as the affairs of the Association were concerned, he felt thankful to the members, because he thought it was due to their loyal support that they had come through so comfortably. He was very glad indeed to take this opportunity of thanking the members and the Hon. Secretary for their kindness throughout the year, and for the kind reception he had received on all occasions. He could only hope their new President might have as pleasant a year as he had had, because he could not wish him a kinder or better reception.

The PRESIDENT then delivered the following

INAUGURAL ADDRESS.

Gentlemen,—May I first express personal acknowledgments of the honour you have been pleased to confer in electing me to the presidential chair, and say that your decision is accepted more from a sense of the responsibility common to every member of an Association such as ours, than from a feeling of any special fitness for the office. Our proceedings are just what the members choose to make them—being dependent entirely upon individual effort; and every member should be prepared to apply his best efforts for their benefit.

During the last few years the impression has been growing upon me that my position and business experience are, in some respects, behind the times; and I approach the task of laying a few ideas before you with some feeling of trepidation and doubt as to the possibility of bringing up any new or interesting matter, seeing that the greater part of my business career has been spent in a slow-going, old-fashioned city situated in a slow-going, old-fashioned part of the country. Naturally, on this occasion one's ideas go back to the old South-West Association, which was taken under your protecting wing some ten years ago; and possibly my position to-day is intended as, in some sense, a recognition of the members of the Association who are still with us. In taking the chair as a south-west man I am looking for the support of my old friends in the south-west district. The pleasure of presiding at these meetings will be enhanced by the presence of a good representation from that quarter on the other side of the table.

The keynote of the present position of the gas industry, which is the subject that especially concerns us to-day, is to be found in the word "activity." Perhaps there was a time when the tendency towards the "rest and be thankful" order of things was a little too pronounced; but nothing of the sort can be laid at our door to-day. It has passed away in company with a few notions and traditions of the fine old-crusted kind, which at one time dwarfed and enfeebled our technical progress, and now, in regard to almost every one of the numerous departments that go to make up the total of the duties of the modern gas-works manager, we are called upon to follow a policy of improvement and advance. Scarcely a single piece of apparatus or method of procedure has escaped a thorough shaking up, turning upside down, and inside out; and we are urged every week to adopt some new departure or other. It is essentially necessary, under these circumstances, to keep a level head, and to remember that the motto "hasten slowly" applies particularly to our position. The vendor of the novelty can send in his account, take his cheque and go off to pastures unknown; but we have to take the innovation in to live with us. And whatever happens, we have to sell gas cheaply, and show a balance sufficient for dividends. And while we hear eloquent accounts of the advantages to be secured by adopting this or that, there are sure to be some counteracting disadvantages that do not make themselves evident until after we are fairly committed and have the thing in going order.

As examples of these present-day topics, the various cupola processes, the size and position of the retort, the manufacture of a sootless fuel, improvement in purifying boxes, and the question of distribution may be referred to. Looking at the large extent to which the cupola—so designated in contradistinction to the retort—has been adopted, it deserves some extended notice; but I can only confess to having no practical experience in working water-gas processes. Every detail connected with the retort appears to be under investigation. There is the question of vertical, the inclined, or the horizontal position, in which connection it is not possible to withhold some expression of the satisfaction experienced by the members generally, at the degree of success already obtained by our ex-President in the matter of the vertical retort. Those who had the privilege of visiting Bournemouth last May enjoyed several valuable object-lessons. One point that particularly impressed me was the absence of anything in the way of trotting along old-established ruts; while at the same time nothing was taken for granted, but everything was proved. Following such an excellent example, one cannot get wrong. In

connection with the carbonizing apparatus, there is the very wide subject of the application of motive power in place of the barrow and shovel, as a means of transferring solid material—comprising stoking, charging, drawing, and conveying machinery. In connection with some of these processes, the usual expression "drawing a retort" becomes a misnomer.

As makers of large quantities of coke, we cannot afford to overlook the steadily increasing demand for smokeless, or shall we say sootless, fuel? You are well acquainted with the progress of the smoke abatement movement; and I believe there is a large demand for coke for domestic purposes, not only in large towns, but even in villages. Hitherto everything else has had to give way before the yield and the photometrical quality of the gas; but it may be worth while to consider the desirability of improving the quality of the coke. With the increasing outputs of gas, the gas-works can do a great deal towards meeting the demand for sootless fuel, even at a reasonable, though not excessive, sacrifice in respect to the yield or quality of gas. But the idea of losing half the gas in order to get a better quality coke does not commend itself as a practical one to gas engineers, nor does the prospect of 50 per cent. more tar enhance their opinion in its favour. So far as I understand, the public are willing to adopt smoke abatement if they can save money by it, but not without; and their ideas will need to be greatly advanced from the present position, before they will be willing to pay a substantially higher price for a smokeless fuel. To the gas engineer the solid residue remaining in the retort after extracting the volatile matter has always been known as coke; and I would prefer to see the term retained in use, with a qualifying adjective if necessary, rather than replaced by some meaningless fancy title. One way in which the quality of coke might be improved would be the adoption of some better method of cooling it. Douching it with water cannot be expected to improve the quality, if it does the weight. Coal saturated with 5 to 10 per cent of water would scarcely command an active market or a high price; and the same applies to coke. In conducting laboratory tests of coal, it has always been my practice—in order to avoid the error due to absorption of variable quantities of water—to smother the coke by shutting it up in an iron box. I have frequently noticed that coke so treated burns more freely in an ordinary grate, and is superior in a marked degree as a fuel for household purposes, as compared with ordinary gas-works coke.

The value of coke in particular, and of the other residuals in a less degree, in assisting towards the maintenance of a level price for gas, is of great importance in regard to the stability and well-being of our industry. The business would be considerably prejudiced if we were obliged to keep the price in tune with the vagaries and fluctuations of the coal market. Fortunately for us, the price of coke always sympathizes with that of coal; and the actual loss due to increased prices paid for coal is, in practice, reduced less than one-half by increased returns for coke. The profits obtainable from coke, however, do not belong to the vendors of coal, as some of them appear to suppose. What with miners combining for reduced hours of labour, and endeavours of gas-coal producers to form a ring or combine sufficiently powerful to control the trade, the outlook is not particularly rosy; for in face of such powerful hostile forces arrayed against us, it will be necessary to consider united action for defence. Fortunately, we are not without resources of various kinds.

Tar and ammonia have been let severely alone for a long time—probably because we have so many other irons in the fire. We have heard but little lately about the utilization of tar, or the application of ammonia for purification purposes, and our condensers, washers, and scrubbers remain as they were twenty years ago. Notwithstanding the numerous valuable constituents that can be extracted from tar, we are still face to face with the extraordinary fact that the most lucrative outlet for the residual is to sell it to the nearest farmer, as a cheap substitute for paint, to be applied to pigstyes and cowsheds. In my own practice at Salisbury—where we are at some distance from the nearest large user, and therefore the cost of railway carriage tells up—we have met this matter to some extent by putting down a drying floor, and preparing tar asphalt of a quality superior to the tar-ash so well known in gas-works. We use stone chippings of various sizes, and supply coarse for the bottom layer, and fine for the finish, and undertake the complete laying of flooring for playgrounds, carriage yards, workshops or store rooms, garden walks, and places of this kind.

I may remark that the men who prepare the tar asphalt have also been encouraged to give their attention to the preparation of cement concrete, using the clinker and broken fire-brick from the retort-house as aggregate; and all rough work—such as the back walls of the cellars for the furnaces, an oxide box for the sulphate apparatus, various retaining walls, &c.—has been constructed with no other expense than that for cement and labour.

Important improvements affecting the cost of purifying boxes have been made of late years. I refer to the introduction of dry-faced lids in place of the water seal, and various simplified schemes for the change valves and connecting pipes. About two years ago, I had the pleasure of bringing before your notice some details respecting an improvement of this nature, and would now only say that subsequent experience fully justifies the extension. We have had a very easy time with regard to purification, and there has been no expense in the way of renewals or repairs, nor is there any immediate likelihood of such. We are able to work up the oxide to a sufficient proportion of sulphur to ensure a ready sale; and the total purifying charges are extremely low—something under ¼d. per 1000 cubic feet of gas made.

Leaving these quiet by-ways, and passing on to the question of distribution, we are confronted by a state of things in which the changing order is more evident, if possible, than in the retort-house. Those of us who started in the profession thirty years ago or more, can recall a time when Mr. Newbigging's "Golden Rule" about keeping down the pressure was generally practised to an extent somewhat greater than the author himself would be likely to advise. When 90 per cent. or so of the total consumption passed through open flat-flame burners, an excess of pressure was strongly objected to, as an iniquitous device, having for its object an unholy acceleration of the speed of the measuring machinery at the consumer's meter. As such, it was one of the stoutest planks in the platform of the Gas Consumers' Protection Associations, which are long since defunct and received no funeral honours. But with the introduction of the enclosed or atmospheric burner, either in connection with incandescent lighting or otherwise, the demand is for more pressure; and soon it will be necessary either to have a gasholder in every street or to supplement the gasholder pressure, which at present is depended upon as the motive force for distribution of gas, by mechanical devices of the "boosting" kind. It is safe to say that the average supply pressure at the works' governor has been doubled within the last thirty years; yet who hears anything about excess of pressure now? With the passing of the open burner, there has also departed the outcry against excess of pressure, and at the present rate of progress in consumption we are called upon to face important modifications of the old-established ideas as to supply pressure.

Concurrently with the gradual displacement of the open by the closed burner, there has been another and perhaps more important alteration, and that is the extensive expansion or increase in the area covered by the population of our towns, large or small. I can remember when a five-mile radius from the Bank of England fairly enclosed the whole of the London suburbs. A ten-mile radius would not do it to-day. Our second-class towns exhibit a similar condition of things; and smaller places, of 50,000 population or less, that formerly had no suburbs worth the name, now have their outlying districts. The tube, railway, and tramcar in our large towns, and the motor or bicycle in large and small alike, enable the people who formerly lived over their business premises or within easy stepping distance of them to go out some miles into the country for their rest and recreation, and even to lunch in the middle of the day if so inclined. From the largest to the smallest, we all have this question of the supply to outlying districts very much before us. In place of a nice compact coterie of streets, all comprised within one or two square miles, which formerly constituted the district plan, we have an ugly disjointed affair covering four times the area, and including several long spider legs, any one of which may represent some miles run of piping.

These two causes—the demand for higher degrees of pressure, and the increased area to be covered by our distributing system—would be sufficient of themselves to keep us from lapsing into an unwholesome state of do-nothingness. But we have also to face the fact that the consumers' ideas as to the extent of the gas company's responsibilities have developed in a more than commensurate degree. These were formerly considered to terminate at the consumer's meter; and the complaint book did not soar beyond choked services and stopped meters. But the man at the works is now held responsible for any and every happening up to the burners; and the average consumer disturbs himself and the gas company more over a small inconvenience—such as dust in his atmospheric burner, or the slight escape caused by a tap plug or hinge joint going dry—than he used to do over an explosion that might blow out a window or two. We have (and very wisely in my opinion) accepted the responsibility of meeting our customers' convenience by laying ourselves out to attend to complaints of all kinds, which cannot be done without considerable increase in the distribution department. The extent of ground daily covered by all classes of employees outside the works—including meter inspectors, collectors, service layers, gas-fitters, lamplighters, and maintenance men—must necessarily mean increased costs if the thing is to be properly done.

During the last few years I have laid down several miles of wrought-iron or steel main pipe, including wrought-iron screwed tube up to 4 inches diameter, and Mannesmann tube up to 8 inches. All this work will be available for a high-pressure service at a future time; but up to the present I have not had occasion to fall back on the aid of mechanical or reinforced distributing pressure. As an example of the kind of work to which malleable pipe is especially suited, may be instanced the supply to the village of Bratton, which comprises a 3-mile run of 4-inch screwed pipe, carried from Westbury. At present there are about 80 consumers, mostly small users, and they get a sufficient supply on the ordinary distribution pressure, assisted by a rise of something like 100 feet in altitude. In every case there is a marked increase in the supplying capacity in proportion to the size of the pipe; and it is not too much to say that a wrought-iron or steel pipe will supply 30 to 40 per cent. more gas than an ordinary cast-iron socket-and-spigot pipe of similar size and under equal conditions of pressure. The smoother interior surface, and less breaking-up by joints, ensures less skin friction and less hindrance to the flow of gas. At Salisbury, we have laid down several runs of malleable pipe on the outskirts of the district; but our principal work has been an 8-inch supplementary feeder to the

north section. A peculiar feature of gas-works in the south-west is that they are rarely well situated from a distribution point of view. They are a long way from the centre of consumption and usually right on the edge of the district, if not some distance beyond it. Under these circumstances, difficulties are apt to arise at the opposite point of the compass, particularly if altitude is not favourable. Salisbury is especially bad in this respect. The district of supply is somewhat in the shape of a saucer, with the works on one rim, and a large consumption on the low level. In addition, it is irregularly intersected by brooks and rivers, with a scanty supply of bridges. The feeders have to be arranged according to the bridge accommodation, rather than in the most direct route; and the supply to some parts follows a very circuitous course. This was especially the case on the north-east district—not a mile as the crow flies, but about three miles as the gas had to go. A private road having been laid out, we were able to arrange a direct course, and the work has been completed some fifteen months. We now head off from the works in three separate directions, and are able to get satisfactory pressure diagrams in all parts. For driving the socket joints of steel tubes we have a very decided preference for lead wool.

One special advantage in connection with Mannesmann tube is that the makers will, if desired, supply a whole pipe, or any required length of it, flattened to an oval shape. The 8-inch pipes can be had in oval sections 5 in. by 10 in. I do not know how it is with the bridges elsewhere, but in Salisbury we look upon the prospect of obtaining rights to cross a bridge in much the same way as a certain personage is supposed to regard holy water; there are so many different authorities interested in the ownership and in the water rights over the rivers. Most of our bridges are built with solid stone arches, and leave very little clearance between the crown and the road surface. We wanted to carry our 8-inch pipe over a bridge constructed of solid masonry, with only 12 inches clearance between the crown of the arch and the surface of the road. Three lengths of flattened pipe—one long one for the centre and two short ones for each side—enabled us to carry out the work without disturbing the bridge, and without incurring a charge of £10 a year rent, which we should have had to pay to the owners of the water rights if we had gone outside the contour of the bridge, either on one side or under the bed of the stream. The pipe is carried through in the centre part of the road so as to get the benefit of the camber, and is embedded solid in concrete.

Much has been said of late years—but by no means too much—about the desirability of educating the gas consumers. Such efforts may well include people who at present do not come under that heading. Some good work has been done; but effort in this direction must be increased and not relaxed. A very real difficulty is in connection with the older class of gas consumers, many of whom are to-day expecting to get a good supply through a distributing system that ought to have been cut out—lock, stock, and barrel—years and years ago, and passed over to the old metal merchant. They resent the trouble and inconvenience involved in doing the thing properly, and resort to all sorts of incomplete botching. Every possible excuse is made in the way of shifting the blame on to the gas supply, as it is cheaper and less troublesome to grumble at other people than to accept one's own share of the responsibility. One great lesson that should be fully impressed upon gas consumers is the fact that the vicissitudes experienced during fifty or sixty years are sufficient to entirely incapacitate any set of supply pipes. Compo pipe is apt to be battered and flattened in various places, at times of spring cleaning, painting, and repairing, or alterations; and iron pipe becomes clogged with rust. And a second is the fact that gas-pipes will-not necessarily carry a supply for 30 or 40 feet per hour stoves, because they are sufficient for 3 feet per hour gas-burners. A consumer with a decrepit worn-out system of supply is greatly prized by our competitors, as by replacing the worn-out remnants of fifty years ago with a brand-new up-to-date system comprising all the latest improvements, they are able to score a tremendous advantage on that account alone, the whole of which is appropriated to the credit of the innovation.

Holding these views, I have the greatest possible sympathy with movements such as that adopted by the South Metropolitan Gas Company in regard to water-slide gaseliers. A great deal can be done in this direction at a cost equivalent to less than ½d. or 1d. per 1000 cubic feet of gas; and more benefit will result to the consumers and to the company by improving the service than by reducing the primary price. There was a time when reductions in price were regarded as the sole end and object. There is now no pressing demand for cheaper gas; but on all sides there is a loud demand for what, in effect, comes to full control up to the point of combustion. It is no use to talk to-day about the gas companies' responsibilities ceasing at the meter.

The success of the slot system, of maintenance schemes, and of gas-cookers and gas-fires when supplied and fixed by the company, is largely due to the fact that these systems include control up to the point of combustion. And as already remarked, our efforts in this direction must be increased and not relaxed. Meanwhile the attention of practical gas-fitters, whether employed by gas companies or otherwise, may well be directed to the problem of how to pipe an occupied and furnished house—not necessarily in the cheapest, but in the neatest and most efficient manner, and especially at a minimum of inconvenience to the inmates. Pipe and connections are fairly moderate in price, so that in most cases it is more a question of convenience than of cost. Those responsible for the control of a staff of gas-fitters will do well to remember that neatness and smartness in carrying out indoor work are much appreciated.

This naturally leads up to the question of technical education as applying to gas-works managers and to the employees in general—a subject which I regard in a wider sense than is usually applied. Technical education embraces a great deal more than a list of the various "ologies" that should be included in the curriculum of the future gas manager. I am glad to see that at last gas engineering has been accorded a chair in a technical college, and that some of our leading gas companies offer special facilities and encouragements for the acquirement of technical knowledge by all classes of gas-works employees. There has been too much of a tendency in the past to assume that the position of engineer or manager is the only one that carries any responsibility from a technical point of view, and is the only appointment that is worth having. It is obvious that of the hundreds and thousands of young men now being trained to a technical knowledge of gas engineering, only a small proportion can expect to obtain a manager's chair. I do not say this with a view of discouraging them, as I believe there is plenty of room for them in the profession. If there ever was a time when a gas undertaking could be successfully run by one able manager with the aid of a staff of the cheapest and lowest order (which is doubtful), at the present day it is necessary that the inspectors, meter-readers, collectors, and all that come into actual contact with the consumers, should be capable of utilizing every opportunity of making known the advantages of gas, and of securing a possible customer. Instead of super-saturating the district haphazard with services, meters, and cookers, a proportion of which may not be fully utilized, it is better to see what can be done in the way of increasing the consumption amongst present users. A hundred customers taking on the average ten lights each, require less outlay, and are a more profitable line, than 250 customers at four lights each; and one steady regular user is worth half-a-dozen intermittent ones. This point cannot be properly developed without the aid of an energetic and thoroughly efficient staff. Technical education is not a thing to be bottled-up against the attainment of the desired managership.

When we talk about "encouraging" young men to improve themselves, we must not forget that any encouragement which omits the item of £ *s. d.* is simply a delusion and a snare. It is not right that young men should be induced by the rush of competition to apply their best energies for the benefit of shareholders and consumers, and get something considerably less than the retort-house rate of wages in return. The best attraction to the highest class of ability is the knowledge that adequate remuneration is obtainable.

In some of our public institutions, the clothing is made up by contract, and all of one size for large and small alike; and our educational systems appear to my idea to partake too much of this characteristic. The plan answers well for those who come nearest to the average; but it does not develop and bring out the individual characteristics. Consequently a lad does not find out in what direction his tastes for a life occupation lay, and runs some fad about going to sea, or being an Australian bushranger or a member of the Cape Police. Many of us can recall a time when our ideas as to our life's work blew about with the wind, and required all the firmness of a judicious and clear-sighted parent or guardian to divert them into the appropriate channel. I have frequently observed that the proportion of those who having once given our profession a fairly honest trial relinquish it in favour of another, is very small. The variety of occupation afforded, embracing as it does a fair proportion of outdoor exercise, is attractive to the average Englishman. But it is desirable that the beginner should be assured not only that he has the inclination, but also the necessary mental and physical qualification.

All the members of a large class can no more assimilate the same amount of instruction than they can the same amount of food. Some are underdosed, others are overdosed. Specimens of the latter class are of no use for our profession. It is one of continual application and strain, that calls for a very high degree of physical health and strength. Young people are urged to apply themselves, and especially to undertake violent spurts with a view of passing some specially stiff examination—a proceeding that I regard as running on the same lines as ringing the luck of Edenhall. Such excessive application, particularly during the growing period, is apt to develop special weaknesses in digestion or nerves that are likely to be a serious drawback when settling down to permanent work. A brain carrying all the "ologies" is of little use if attended by weak nerves, flabby muscles, or a delicate physical system. A man who has developed soundness in this direction—by regular and simple habits of life, and avoidance of high living and late hours—can make a very good showing at the gas-works, notwithstanding educational deficiencies. I do not wish to belittle the advantages of technical classes and laboratories, but at the same time would point out that they cannot teach everything, and there is much that can only be learnt at the gas-works.

Questions relating to the purchase of materials, or to sales; to the relations with the workmen, which include setting each man in his right place, where he can exercise his best abilities to the advantage of himself, his employers, and his fellow workmen; to dealing with the customers; and various matters of policy—can only be dealt with after a certain amount of business experience.

We have heard a great deal about the commercial section; and it is natural with the increasing detail and extent of our business that it should tend to come to the front. The gas manager of to-day must be fully equal to, but at the same time must rise beyond such details as making another 100 cubic feet per ton of coal, or reducing the purification by ¼d. per 1000 cubic feet. He must also remember that his own personal habits, to a large extent, set the tune that will be followed by the staff that he is called upon to superintend. No amount of technical knowledge will compensate for or cover up deficiencies in ordinary business acumen and acquaintance with human nature, or of the principles concerned in successful buying and selling.

There is a general impression amongst those whom we may allude to as outsiders—that is to say, who have no practical knowledge of the details of our industry—that gas companies are greatly indebted for their present satisfactory position to the assistance and the protecting wing of the law. We are often reminded that we have a monopoly, and it is spoken of as being an unconditional gift; whereas the fact is that Parliament never hands out a privilege with one hand, without also claiming an equivalent obligation with the other. Any favour granted to a gas company is given as much (or more) with a view of benefiting the consumer as of assisting the shareholders, and is always attended with obligations. It is remarkable, and also very fortunate, that we are able to conduct our everyday operations with very little assistance from, or reference to, existing laws. Fortunate, I say, in view of the extraordinary character of the general law as instanced in the regulations relating to our dealings with the public and with our customers as set forth by the Gas-Works Clauses Acts of 1847 and 1871, and by the Sales of Gas Act, 1859. They may be likened to a Nebuchadnezzar's image—being partly made of gold and partly of rubbish. The head of gold is represented by the admirable enactments which secure to the consumer a supply of gas of guaranteed quality at the lowest practicable price. The gas must be sold at bare cost *plus* a limited and extremely moderate interest on the capital invested; and every possible care has been taken to induce those who are so short-sighted as not to see the desirability of cutting the working expenses and the expended capital to the lowest possible limit, to conform to such rules of conduct, by making it to their interest to apply every practicable care and skill. It is not too much to claim that the English practice is the admiration, and often the envy, of gas consumers in all parts of the world, and is always consulted when the question of selling gas at a cheap rate is under consideration.

On occasions when the finances of the undertaking come before the public—as, for instance, in connection with rating assessments—there is too much tendency to dwell upon the monopoly and to overlook the regulations, and to forget that whatever privilege has been conferred has been paid for by a counterbalancing obligation. When a commodity has been paid for in one form, it is not usual to charge it in a second. And yet we often hear the monopoly quoted as justification for an exorbitant rating assessment, or for some other way of penalizing the concern. It seems absurd to go to great expense in getting enactments that should secure to the consumer the benefit of cheap gas, and then to unpick a substantial share of the good work by saddling the concern with a permanent tax in the form of a high charge for rating purposes, or otherwise. And the public, or rather the gas consumers, are apt to imagine that such charges must of necessity come out of the profits, whereas on point of fact they come out of the price of gas. Picture puzzles are rather in vogue just now, and I would suggest a subject for one. A gas undertaking paying an average of 6 per cent. dividend on its invested capital, has its assessment raised (say) £5000 a year, or the actual annual payment about £2000. It continues to pay the same rates of dividend. Query: Who pays the additional £2000?

But we are not only supposed to have a monopoly, but also to pay maximum dividends—with a very big "M." The word is taken in comparison with ordinary business profit, and not in the sense in which it is used and understood by parliamentary agents. Gas companies have no large wide-spreading monopoly for the sale of light and heat with unlimited privileges or unlimited profits, but only a very narrow one, for the sale of gas, and their profits do not represent 40, 30, or even 20 per cent. on the investment, but average about 6 per cent. Our business cannot be regarded as of the character of Consols, or being free from the elements of ordinary trading risks and contingencies; and therefore it is evident that the maximum dividends are a long way removed from excessive or extortionate profits. As a family man, I should be delighted if the ordinary necessaries of life could be obtained on anything like similar terms. Many of them are so loaded with three or four intermediate profits, that the actual share received by the original producer or manufacturer is a very small fraction of the price figured on the bill.

The "feet of clay" are the regulations referring to main-laying, and the use of the roads, the laying on of services, the testing of meters for accuracy, and the quality of the gas—nearly the whole of which, as compared with modern requirements and working, are chaotic, obsolete, and incomplete. But for the fortunate circumstance already referred to, that the modern gas undertaking is run on lines that render it fairly independent of legislative support, this extraordinary anomaly would have long ago attracted prominent attention. As regards main-laying and the use of the roads, the fact that disputes so seldom arise is more due to reasonableness and forbearance on the part of all the parties interested, than to any clear and definite presentment of the position or of the respective rights. Directly one of the parties departs from this attitude and endeavours to enforce any so-called legal powers, complications are certain to follow. The subject has gradually settled down into lines of generally established custom, in spite of, rather than with the assistance of, our Acts of Parliament. The legal tests for the quality and illuminating power of the gas supplied are on a par with the regulations as to supply pressure. A great deal of confusion is caused by the use of different standard burners. An undertaking that was incorporated fifty years ago will probably have the No. 1 "London" argand burner as its standard, while a company obtaining enactments this year would specify a more modern form of burner, with the remarkable result that so-called 14-candle gas supplied by the old company may be of better intrinsic quality and value than the article claimed to be 17-candle supplied by the new. Not only is this the case as regards the gas supplied to the public, but in respect to published analyses of coals or other gas-making materials.

If the tests of photometrical or of sperm value are to be of any practical utility, the report should be very clear and definite as to the burner used and other details of the test. For this reason many of the recognized valuations of gas coals—such as those appearing in Newbigging's "Handbook" or Paterson's "Lithology of Gas Coals"—are not comparable with modern analyses. This is a fact which it is very important to remember when buying or valuing gas coals. But apart from this source of confusion, which is equivalent to having several different weights all claiming to represent "one pound" avoirdupois, the photometer, regarded as an instrument for the particular protection of the consumer, is scarcely more effective for the purpose than a yard measure would be as a substitute for a pair of scales. The consumers of to-day want calorimetrical rather than photometrical value. Many of them have entirely discarded the open or flat-flame form of burner, using closed or atmospheric burners for all purposes; and the proportion of gas used by the flat-flame is less than 10 per cent. of the whole—perhaps not more than 5 per cent. With regard to supply pressure, a minimum of 8-10ths or 6-10ths simply brings ridicule on the law; for it is generally known that if a manager wants to have any comfort in life he must see that every user gets about 20-10ths.

One especial weak point is that relating to the settlement of disputes respecting the accuracy or otherwise of the meter registrations. Looking at the enormous quantity of gas that is metered, and the extent of the money value involved in the case of large users, there is a crying need for a speedy, reasonably cheap, and satisfactory method of proving the meter. As it is, a consumer who is determined to have his pound of flesh—and an individual of that turn of mind usually stops short at nothing under 20 oz.—can cause an immense amount of expense and trouble. Apart from that, the present methods are unjust to the seller. As a general principle, the buyer is entitled to the turn of the scale. But as the term implies, this advantage should be of a trifling character—something considerably less than that allowed by the limit of 2 per cent. for and 3 per cent. against the seller. This is the more evident when it is remembered that the buyer has the prospect of getting unregistered gas by means of leaky valves, which is a considerable advantage in practice, and the seller has no corresponding advantage. It would be interesting to know what proportion of the so-called unaccounted-for gas passes the meters in this way. I believe it is very considerable; for after every possible deduction or allowance from a 10 per cent. leakage account, the quantity remaining is much larger than might reasonably be supposed to escape without giving some indication of its whereabouts.

But what about those important modern improvements which are rapidly coming up to the forefront of our position—the incandescent burner, the slot-meter, and free-fitting scheme—which are not recognized by any Act of Parliament. We get on fairly well with them, perhaps for that very reason. If a man is travelling in a 50-mile an hour motor car, and comes to a clear level road with no policeman in sight armed with a formidable half-guinea chronograph, it is not in human nature to suppose that he is going to take the course within the 20-mile speed limit. In a similar manner, people who have no legal status are less likely to go to law, and the mere possession of parliamentary powers is in itself a temptation to go in for the costly and uncertain process of standing on ones rights. The power to undertake maintenance schemes or to supply appliances on hire is fairly covered by the wording of several Acts of Parliament; but there is nothing affecting the terms to be charged. Bearing this in mind, it is worthy of note that disputes respecting the charges for hire or for maintenance, whether made direct or in the form of a charge on the price of gas, very rarely occur. And on the other hand, costly and tedious disputes have arisen out of the clauses of the enactments which cover photometrical value and purity.

The standard burner is supposed to be one of a nature that is available for any and every customer who cares to adopt it, and not a mere piece of laboratory apparatus. There is no difficulty in getting a duty of 30 candles or more per cubic foot from ordinary 16-candle gas, and many consumers actually realize 20 candles by means of the incandescent burner, which conforms to such conditions. The expression 16-candle is therefore a misleading misnomer—as much out of order as the provision that the pressure at the consumer's meter should be 6-10ths in the day and

8 10ths at night. It has taken nearly a hundred years to find out that the consumer can take care of himself without the help of parliamentary enactments, inspectors, pressure-gauges, photometers, and calorimeters. Apart from any fear of the penalties for default, no gas company in its senses would think of stinting either quality or pressure. If they do not already know that such a policy is simply suicidal, they will soon find out. As regards the popular slot-meter system, I do not know that any legislation is called for or would be of very much use if passed. Existing enactments sufficiently protect the rights of ownership as regards meters and fittings; and as regards errors of registration it is better to take the chance than to raise questions involving additional payment which in nine cases out of ten cannot be recovered. It can best be worked on a vigorous policy of the "hit first and talk afterwards" style—involving some degree of personal knowledge of the habits of the customers on the part of the inspectors, a careful weeding out of all undesirables, or customers using less than the minimum required to yield a fair interest on the outlay, and a fair amount of intelligent canvassing for additional gas consumption. The success or otherwise of the system depends upon the maintenance of a certain average per consumer; and anything that will increase the average will increase the profits. It can be made an excellent means of advertising the advantage of competent technical control up to the point of consumption.

Indiscriminate canvassing is little better than none at all; and therefore I say "intelligent canvassing." We want to develop a steady, respectable business, and fly-a-away customers of the "here to-day and gone to-morrow" kind are not worth spending money upon. The proper place for a gas-stove or set of fittings that is out of use, and not likely to be used, is the gas-works store, and not an empty house. Some people think they "might as well" have the gas laid on if there is nothing to pay, but have no intention of using it. They are no use to us.

In connection with the vexed question of rating assessment, there is room for a more just, a more definite, and a more dignified method than at present in vogue. If a dispute arises and the case is carried to Quarter Sessions, the union put in a powerful array of counsel and of expert witnesses to prove that the valuation is (let us say) £20,000. The gas company follow with equally powerful evidence to the effect that £10,000 would be a very liberal estimate. The authority hearing the case has probably no special knowledge of the subject; and without any reflection on his abilities, I may venture to suggest whether he is not bewildered rather than enlightened as to the real matter at issue, by the technicalities of the evidence and the explanations of counsel. His personal sympathies naturally run more towards the ratepayers or the public than in favour of the shareholders (the point above mentioned as to who pays the increased rate being entirely overlooked); and a pronouncement is given that blows towards the union estimate—probably about £17,000 or £18,000. Dr. Johnson is said to have acknowledged, that when reporting from memory the proceedings in the Houses of Parliament, he took care that the —— Whigs did not get the best of it. In telling this story the adjectives before the word "Whigs" is varied according to the time of day, whether before dinner or after. The usual experience of gas companies who are so unfortunate as to get into the Law Courts is that in cases of doubt there is a disposition not to let them have the best of it.

It is admitted that the valuation should be based upon the profits; and the ground is so far cleared in that the amount of profits is usually limited. In the case of a gas company under standard rates, it is absolutely fixed; and where the sliding-scale is used, there is no difficulty in getting close to it. A special valuation showing the gross profits is therefore superfluous; and when it extends to substantially more than the shareholders can legally appropriate, it is absurd. I know of no other instance where the existing facts as to rent or profits of trade are not accepted as such. If a tradesman or householder gives in his rent as £100, or his profits as £1000, accompanied with satisfactory evidence as to the correctness of the figures, there is no attempt to go beyond them. If it was proposed to call special evidence to prove that the rent should be £150, and the profits £1500, the suggestion would rightly be called unjust and unfair. Yet I have seen valuations of gross profits on a gas undertaking that go 30 or 40 per cent. beyond the legalized maximum profits. The gross profits being fixed, it does not seem impracticable to hit upon a fair proportion or ratio that would fairly hold the balances all round.

	Income.	Assessment.	Ratio.
No. 1	£300 ..	£30 ..	1 to 10
,, 2	500 ..	50 ..	1 to 10
,, 3	2000 ..	150 ..	1 to 13
,, 4	5000 ..	400 ..	1 to 12
Gas companies			1 to 3

This leads up to the point which, to my idea, constitutes the greatest grievance that the gas company, as representing the consumers, has to complain about. The sense of the Acts relating to assessment is that every ratepayer should bear a proportion of the total expenses according to his income earned or received from the district in question. A man may own a hundred shops in various parts of the country, and the profits in each one would be assessable in the district where it was situated. But the majority of the ratepayers derive their income from the one district in which their residence or business is situated. Looking down any rating list, we find average examples such as the following: A householder, with an income of £300 a year occupying a house assessed at about £30; or with £500 a year living in a house assessed at £50. A well-to-do shopkeeper or professional man with an income of £2000 is assessed on £120. A trading company making £5000 a year, occupies premises assessed at £400. Note the proportion between income and assessment value—ranging from 10: 1 to 16: 1. The gas company are usually assessed at from one-half to two-thirds of their maximum profits. Their actual payment probably represents a 5 per cent. discount on every gas bill, and one-third or more of the divisible profits. Why should the average ratepayer pay one-twelfth and the gas company one-third of its income?

Oh! we are told, but you have the use of the roads. We have the use of the subsoil in a manner that interferes with nobody and causes nobody any expense. But directly we touch the surface of the roads we have the privilege of re-installing them. The road authorities do not suffer by this arrangement. We break up an old worn-down crust of about 3 inches thickness, composed of inferior local flint, and we are expected to replace it with about 8 inches of the best granite road metal. Or we pull up a quantity of setts that are half worn, and would in any case have to be replaced at an early date; and we are called upon to relay the breach with brand new ones, or possibly pay a liberal figure to have the same done by the authority at our cost. There are many trades that employ heavy vehicular traffic, and they are the ones that have the use of the roads, in the sense that they wear away the surface, which has to be replaced at intervals by the local authority, but the fact is not considered in their assessment.

And now it only remains for me to thank you for your attention to these rambling remarks, to wish every success and prosperity both to yourselves personally and to the interests which you represent, and to solicit your best and most active co-operation for the good of our Association during the ensuing year.

Mr. E. C. Riley (Swindon) said he felt it a privilege to have the opportunity of proposing a vote of thanks to the President for the excellent address he had delivered. He imagined he (Mr. Riley) was thus privileged through having been an old colleague of Mr. Humphrys in the South-West Association before its absorption in the greater and more important Southern Association. Mr. Humphrys had taken very great interest in Association work all through his life. He should also like to say this, that many gentlemen present were associated with large works; but the majority of the gas managers of the country were in charge of works under the 100 million standard. Mr. Humphrys had rendered great service by his sympathy, help, advice, and encouragement to such men—men many of whom were working in lonely places at a considerable disadvantage. In his address, he had not given any comparisons with modern machinery. That was a matter they had all had to consider; and they had had the great advantage, during the late President's year of office, of seeing some of the modern progress that had been made in this direction. That day, however, they had had in the address a general survey of the details of gas management, which were not generally voiced in presidential addresses. Their heartiest thanks were due to the President.

Mr. W. B. Randall (Waltham Cross) seconded the motion, which was unanimously passed.

The President thanked Mr. Riley and Mr. Randall for their kind remarks. He added that he hoped the members would, on looking over the address, find in it something which would be worth thinking about.

The Workmen's Compensation Acts.

The President remarked that a most valuable paper had been prepared by Mr. Thomas Berridge, of Leamington, on the question of the Workmen's Compensation Acts. He was sure the paper would be read with the greatest satisfaction by the members. As time pressed that day, it was proposed (as announced) to take the paper as read; and to discuss it at a future meeting.

[The paper is published on pp. 697-99.]

This concluded the business proceedings.

Annual Dinner—The Franco-British Exhibition.

A little later, the President took the chair at the annual dinner. Among the guests were Mr. Harold E. Copp, the President of the Midland Association, and Mr. F. C. Humphrys, of Ilkeston. Mr. J. Davis, the President of the Eastern Counties Gas Managers' Association, was also present. The toast list was somewhat long; but the speeches, and the music and recitation with which they were interspersed, were most enjoyable. "The Southern District Association of Gas Engineers and Managers" was proposed in felicitous terms by Mr. F. W. Goodenough; and response was made by the President. The "Past-Presidents and the Committee" was a toast submitted by Mr. R. Bruce Anderson; and the immediate Past-President (Mr. Harold W. Woodall) made reply for the long list of his predecessors and for the Committee. In happy speech, Mr. E. C. Riley submitted the "Institution of Gas Engineers and Kindred Associations." As Junior Vice-President of the Institution, Mr. J. W. Helps replied. Mr. Riley had appealed for greater interest by gas companies and municipalities owning gas-works in the research work of the Institution; and Mr. Helps pointed to the difficulty experienced in getting gas companies and committees to see that it is to their advantage to provide the "sinews of war," so that the Institution

can carry on the work of research, which would benefit the whole country. But, as he remarked, funds are required not only for research, but for showing that gas undertakings are good "shopkeepers"—a term that had been employed earlier by Mr. Goodenough in referring to the expanding duties and responsibilities of gas managers. The allusion appropriately gave Mr. Helps an opening to press the claims for financial support to the work of the Committee for the Gas Section of the Franco-British Exhibition. It is estimated that between 40 and 50 million people from all parts of the country and the world will visit the exhibition; and Mr. Helps is most decided in his belief that much good will consequently result from making a good gas demonstration. The Committee are proposing to show in specially constructed apartments what can be done with gas in various ways, both for domestic and for industrial purposes. What is wanted to make an effective display is money. The whole expense is to be borne not by the manufacturers and traders in gas plant and appliances (they have done their part of late), but by the gas undertakings of the country. Nearly £3000 has been collected; but what the Committee want is double this amount to make an effective display. A circular letter is to be addressed to practically every gas engineer in the country, asking for the earnest consideration in this matter of their Boards. The Directors of the Derby Gas Company, it was mentioned, have sent (doubtless on the recommendation of their Engineer, Mr. J. Ferguson Bell) 50 guineas towards the funds; and Mr. Harold Woodall stated that the Directors of his Company (the Bournemouth) had sent £100. Following Mr. Helps, Mr. Harold E. Copp replied to the toast on the part of "Kindred Associations." Long intercourse, through the same service and personal friendship enabled Mr. J. Tysoe to speak, in proposing "The Hon. Secretary," intimately and freely of the high distinguishing qualities of Mr. A. F. Browne; but when that gentleman came to acknowledge the enthusiastic endorsement of a well-deserved tribute, he caused much regret by announcing that he could not possibly continue to fill the office after a further two years. Gracefully, Mr. J. Terrace proposed "The Visitors," a toast to which Mr. F. C. Humphrys made cheery acknowledgment.

MIDLAND JUNIOR GAS ASSOCIATION.

Third Annual Meeting.

The Third Annual General Meeting of the Midland Junior Gas Engineering Association was held at the City of Birmingham Technical School, Suffolk Street, last Saturday afternoon—Mr. W. E. Caton, the President, in the chair.

The Report and Balance-Sheet.

The Hon. Secretary (Mr. J. Hewett) read the report of the Council and the balance-sheet. The former stated that there were now 134 ordinary members of the Association, compared with 120 and 110 respectively for the two previous sessions. Of new members, 29 had been elected during the present session; and three ex-members had been re-elected. Resignations were received from twelve members; and the membership roll had been further depleted by the removal of six names in accordance with Rule 6. Though the loss of so many members was to be deplored, the net gain of fourteen members was an indication of the continued vitality of the Association; and the Council were of the opinion that the present condition was most satisfactory, and promised well for the future. The Association were indebted to the President (Mr. W. E. Caton) for his able address, and to the readers of the papers, which had been of a high standard and generally followed by interesting discussions. The visit to the Manchester Gas Exhibition proved a great success; and the thanks of the members were due to the Manchester and District Junior Gas Association, who so excellently carried out the arrangements for the day. The visit to the gas and electricity works of the Stafford Corporation, at the kind invitation of Mr. Hubert Pooley, the Engineer and Manager, was highly appreciated by those who were able to be present; and the Council hoped that as many members as possible would avail themselves of the invitation of Mr. J. Ferguson Bell to visit the Derby Gas-Works in April. The Committee of the Manchester Gas Exhibition invited the Association to send a representative to attend the opening ceremony in connection with the exhibition. This invitation was gladly accepted; and the Hon. Secretary was deputed to represent the Association. A conference of representatives of the Councils of the Junior Gas Associations in Great Britain was held during February in Birmingham; and the Council felt that benefits to the Junior Associations might be reasonably expected to accrue if the propositions then approved of were adopted. The statement of accounts prepared by the Hon. Secretary, and audited by Mr. J. H. Hardy, showed that the financial position of the Association continued to be most satisfactory; the balance in hand being £31 0s. 9d., which was an increase of £5 19s. 4d. over the previous session.

Mr. R. J. Rogers (Birmingham), in moving the adoption of the report and balance-sheet, said they would all agree with the Council that the past session had been a satisfactory one, and that the present position was most gratifying. There was an increased balance, and the membership was growing. To his mind, the issue of printed slips of the papers beforehand had no doubt been the reason for a lot of members not attending the meetings; but it was most discouraging to a man who read a paper to have to do so before a small assemblage, and he thought that, even if members did not see their way to enter into the discussion, they ought to make some effort to attend and show their appreciation in this way. The thanks of the members were due to the Council for the manner in which they had piloted the Association during the past twelve months. The visits had been interesting; and the papers had been of a high order of merit.

Mr. O. Evans (Wrexham) seconded the motion; and it was carried unanimously.

Election of Officers.

The following officers were elected for next session: *President:* Mr. James Hewett (Birmingham). *Vice-Presidents: Senior*—Mr. J. H. Willoughby (Leamington). *Junior*—Mr. A. O. Jones (West Bromwich). *Hon. Secretary and Treasurer:* Mr. H. E. Temple (Birmingham). *New Members of Council:* Mr. O. Evans (Wrexham); Mr. R. S. Ramsden (Burton-on-Trent); and Mr. R. J. Rogers (Birmingham). *Auditor:* Mr. J. H. Hardy (Coventry).

The Conference of Junior Associations.

The President then read four resolutions that had been drafted to give effect to those which were approved of by the representatives of the Councils of the Junior Gas Associations at the meeting last month, so far as they applied to that Association. In addition to the resolutions of the conference which were recorded in the "Journal" for Feb. 11 (p. 343), he pointed out that it was agreed between the representatives that, unless power was given to the delegates to act, it would be practically useless holding the conferences; and it was considered that anything intended to be put forward at the conferences should first be placed before meetings of the Associations, so that the delegates might know that they were voting in accordance with the wishes of their own Association. A resolution was therefore submitted in the following terms: "That any matter affecting Junior Gas Associations generally, and that has been submitted to the members of this Association, shall be delegated to the representatives to decide. Any proposal carried upon a two-thirds majority—one vote per Association—shall be binding upon this Association." As to the proposed general gathering in London during the Franco-British Exhibition, he thought all of them would agree that the meeting at Manchester was very successful; and as there was an opportunity now of having another general meeting, it would be well to accept the invitation. He suggested that the resolutions should be taken *en bloc*.

Mr. J. H. Willoughby (Leamington) said they had heard what had been done by their delegates at the conference; and he would propose the adoption of the resolutions. It was only right that, if they sent representatives to conferences, they should have power to act. As to the proposed meeting in London, he felt certain, after the experience at Manchester, that this would tend to the general welfare.

Mr. A. O. Jones (West Bromwich), in seconding, remarked that the only debatable resolution was the one making the votes of a two-thirds majority of the representatives binding upon the Association. He thought it was only fair that the delegates should have power to vote; otherwise they would have their journey to the conference for nothing. Of course, the resolutions would be submitted to the Association first, so that the wishes of the members could be ascertained.

The resolutions were then unanimously agreed to.

The President said it was now necessary to appoint those who should represent the Association at the next Joint Council meeting, unless, considering the length of time before the next meeting—in February—it was thought better to leave the Council to make a selection.

Mr. A. W. Smith (Saltley) proposed, Mr. A. N. Comely (Windsor Street) seconded, and it was agreed, that the selection of representatives should be left to the Council.

Sulphate of Ammonia Manufacture.

Mr. Owen Evans (Wrexham) subsequently read his paper on "Sulphate of Ammonia Manufacture;" and this, together with a report of the discussion to which it gave rise, will be found on p. 700.

THE ILLUMINATING ENGINEERING SOCIETY.

At the Annual Meeting of the Illuminating Engineering Society, held on the 10th of January, in New York City, Dr. Louis Bell was elected to office as President; and the following gentlemen were re-elected as Vice-Presidents: Mr. A. Williams, of New York, and Mr. C. E. Stephens, of Pittsburg. The General Secretary is Mr. V. R. Lansingh; the Treasurer, Dr. A. H. Elliott.

The report of the Finance Committee showed that the Society had at the end of the year a surplus of a few hundred dollars, instead of a deficit as was originally feared. The credit balance is due to the advertisements in the published "Transactions."

The new President delivered an address in which he outlined his reasons for believing that the Society had a great future before it. He nevertheless emphasized the necessity of, among other things, increasing the membership roll. In view of the desire for new members, it is interesting to note that the Pittsburg Section of the Illuminating Engineering Society are taking formal action to disband.

IMPROVED LIGHTING IN THE INNS OF COURT.

The Passing of the Flat-Flame Burner.

The Inner and Middle Temples and the other Inns of Court being places of great antiquity, it was only natural that the old flat-flame gas-burners should have been retained in these ancient homes of the law, shedding their "dim religious light" long after they had been displaced by the modern, and certainly more brilliant, incandescent gas-burner and mantle in the adjacent thoroughfares and in other parts of the town. Time, however, in its relentless flight, at last overtakes and invades the haunts of wig and gown; and at "one fell swoop" that which has done duty for nearly a century disappears, and gives place to the new order of things. In such a case, delay sometimes has its advantages, for had the Inns been lighted by the very early incandescent burner some years since, the chances are that they would be doing duty now, and would have continued to do it for many years to come; whereas the period of the upright incandescent burner has been skipped, and the Inns have gone over direct from the old flat-flame burners, with a consumption of 2 cubic feet of gas per hour and an illuminating power of about 5 candles, to the most up-to-date and economical form of lighting—viz., the inverted incandescent burner, consuming only 1½ cubic feet per hour (perhaps Mr. Holmes, of West Ham, will kindly note this), and having an illuminating value of not less than 20 candles per foot. Were it possible for Serjeant "Buzfuz" or any of the "briefless" ones of Dickens's day to revisit the old Inns, great would be their surprise to find the once dingy stairways and passages now brilliantly illuminated. This change has been brought about gradually during the last twelve months by the Gaslight and Coke Company.

In the Inner Temple, 189 flat-flame burners, consuming 2, 3, and 4 cubic feet of gas per hour respectively—say, an average of 3 cubic feet—have been replaced by 189 inverted burners of the "Kemp-Brook" type, each consuming 1½ cubic feet per hour, with an assured illuminating value of 20 candles per cubic foot. The result is as follows: 189 flat-flame burners, consuming (say) 567 cubic feet of gas per hour, at 7½ candles per burner, equal in illuminating power 1417 candles; while 189 inverted burners of 1½ cubic feet consumption and 30-candle power give a total consumption of only 283 cubic feet per hour, but have an illuminating value of 5670 candles—being an increase of no less than 4253 candles, with a saving in gas of 284 cubic feet per hour. These are remarkable figures, and they can be vouched for by the fact that the authorities would not agree to the change from the flat-flame burner with a 2-feet consumption unless a saving could be effected in the *inclusive* charge per annum of the new lamps. The burners have been averaged at 3 cubic feet per hour, although the majority of them are staircase burners of 2 cubic feet only. The figures show that not only has there been no increase, but a considerable saving on the lighting account.

In the Middle Temple, 159 flat-flame burners, consuming 2 cubic feet of gas per hour, have been displaced in favour of 159 inverted incandescent burners of the same type as those in the Inner Temple, consuming 1½ cubic feet per hour. Now, the 159 burners at 2 cubic feet equal 318 cubic feet per hour; while the 159 at 1½ cubic feet equal 238 cubic feet. There is consequently a saving of 80 cubic feet of gas per hour, while the illuminating power of 795 and 4760 candles, at 2½ and 20 candles per foot respectively, shows an increase of 3965 candles.

In Lincoln's Inn, 157 flat-flame burners consuming 2 cubic feet, and 12 consuming 4 cubic feet per hour have been removed from the staircases; while 34 flat-flame outside burners, consuming 4 cubic feet per hour, have been taken down, and 32 4¼ cubic feet Kern incandescent burners substituted, and seven 4-feet burners at the entrances converted into 4½ Kern incandescent burners. The total consumption of the flat-flame burners removed was 526 cubic feet per hour, and represented 1315 candles; while the 157 inverted lamps, at 20 candles per foot, represent 4710 candles, and the 39 Kern burners, at 65 candles each, equal 2535 candles, or a total of 7245 candles—being a gain of 5930 candles, and a saving of 125 cubic feet of gas per hour.

In Staple Inn, which, though not an Inn of Court, may be mentioned here, 30 2-feet flat-flame burners have been replaced by 30 1½-feet inverted burners, with a consumption of 45 against 60 cubic feet of gas per hour, and having an illuminating value of 900 candles, against 150 candles with the old burners. A special feature in this Inn is the lighting of the courtyards by column lamps fitted with twin inverted burners, each consuming only 3½ cubic feet of gas per hour, which makes a very effective and economical piece of street lighting.

Proposed Gas and Electric Association for Indiana.—A tentative meeting of gentlemen engaged in the gas and electric industries of Indiana was recently held at Indianapolis, and it was decided to organize the Indiana Gas and Electric Association; but it was agreed not to name permanent officers until the Committee (of which Mr. S. Murdock, of Lafayette, is the Chairman) appointed to confer with managers of other Companies throughout the State, not present at the meeting, had reported. The initiative in the movement was taken by Mr. James W. Dunbar, of New Albany (Ind.).

THE VALUATION OF FIRE-CLAYS.

At a Meeting of the Birmingham Section of the Society of Chemical Industry towards the close of the past year, a paper on the above subject, by Messrs. E. P. Page and W. J. Rees, was read and discussed. The text of the communication is published in the current number of the Society's "Journal," to which we are indebted for the following particulars.

The chemical and physical properties of the naturally and artificially formed silicates have received, and are at the present time receiving, considerable attention both by mineralogists and technical investigators—the former dealing with the various questions from the geophysical standpoint, and the latter having more regard to the formation of slags, glazes, &c., in industrial operations. In both cases the research has more particular reference to the reactions taking place in the liquid or viscous states. The clayworker studies the question from three standpoints: (1) The production of silicate compounds fusible at temperatures from 900° C. to 1500° C., as glazes. (2) The production of partially fusible bodies, as porcelain—*i.e.*, bodies which "mature" at certain definite temperatures. (3) The production of bodies as infusible as possible, for the building of ovens and furnaces for use in the various industries the processes of which necessitate the employment of high temperatures.

In the first case mentioned, the mixture of the various compounds is heated until it is in a liquid state, and there is opportunity for interaction of the constituents; in the second, only a partial reaction is permissible, and heat is applied just sufficiently to bring about this reaction; in the third, the less reaction there is between the constituents the better. The last instance was the only one with which the authors were immediately concerned; and the purport of the paper was to indicate some of the factors which have to be taken into account when considering the utility of a fire-clay.

A clay cannot be considered as "refractory" which is not equal in fire-resisting properties to the Seger cone No. 26 (about 1650° C.). The rule adopted by the Association of Fire-Brick Manufacturers in Germany is as follows: "The limit of refractoriness of a material is to be considered as exceeded when the material, or one of its constituents, uniformly distributed in fragments, begins to melt or separate by liquidation. Not only the surface of the piece tested but also the face of the fracture must be taken into consideration when judging." There is no such standard in England, neither does there seem to be any recognition of the potentialities in the manufacture of refractory articles. The appearance of a clay counts for much with some people; and the chemical analysis is considered a criterion by which to judge. The following data are necessary for a complete examination of fire-clay: Chemical, mineralogical, and mechanical analysis; specific gravity of the fired wares; porosity; limit of refractoriness; and behaviour of the clay when fired at intervals from cone 1 to cone 10. With this information at hand, one may form a fair idea as to the value of refractory materials for different purposes.

Chemical analysis is of value as indicating the presence or absence of any deleterious substances. A large proportion of fluxing impurities, such as iron oxides, lime, titanium, alkalis, &c., will naturally seriously discount the value of a fire-clay. The usual method of using the ultimate analysis is to consider only the ratio of total fluxes to silica. Richter, Bischof, and Seger have all proved this to be very unsatisfactory, as it left the alumina contents of the clay entirely out of consideration. They showed that the primary ratio to be taken into consideration is that of silica to alumina; and that it is the ratio of total fluxes to this ratio which is important.

Coming to mineralogical analysis, the authors stated that Seger worked out a method for the separation and determination of the three main constituents of fire-clay by treatment with sulphuric acid and caustic soda to remove the clay substance—the residue being then treated for the determination of alumina, iron, and the alkalis—and from the figures obtained the mineralogical composition was calculated. Seger did not claim that his method was strictly scientific; but it is most useful, and gives good practical information which clay workers find of much use, as in considering refractory clays it enables them to anticipate to some extent their probable behaviour at high temperatures. This will be seen if the phenomena of fusion are considered. The first step in the destruction of a clay is the softening of the most fusible constituent, usually the felspar. This fused constituent then reacts with the others, and leads to the formation of more fusible compounds, until finally the whole mass loses its shape.

Passing on to mechanical analyses, the authors pointed out that the nature of a clay, whether of a fine or coarse structure, has some bearing on its behaviour under working conditions. The clay is first broken down by boiling, and an examination of the coarser particles is made microscopically. To obtain definite information and measurements of the grains, recourse must be had to elutriation. This can be done approximately with the Schultz apparatus, or more accurately with the Schoene or centrifugal apparatus. The results of such an examination with the last-named apparatus are given on p. 696.

Specific gravity and porosity are useful factors, as indicating the structure of the manufactured article, and they have more

	A. Per Cent.	B. Per Cent.
Coarse sand, grains over 0·333 mm.	0·68	0·39
Fine ,, ,, from 0·333 to 0·040 mm. .	3·41	26·95
Silt from 0·040 to 0·025 mm.	3·81	14·13
Rock dust from 0·025 to 0·010 mm.	10·92	20·17
Clay substance from 0·010 to 0·000 mm. . . .	81 51	38·55
	100·33	100·19

A is a fat, plastic, refractory fire-clay. B is a lean, short clay.

particular application to special productions—as crucibles, &c. A porosity determination is generally considered the most useful. At the present time, two methods of expression are used. In one, the degree of porosity is expressed as the percentage of water absorbed by a given weight of dry brick; in the other and most rational method, the expression of porosity refers the volume of pore-space to the volume of the brick. The term "specific gravity" is also employed ambiguously; it is used as expressing the specific gravity of the clay, as determined by grinding to powder and using the ordinary method for insoluble powders, and it is also used to express the volume weight of the whole piece.

Having in the first portion of their paper given a definition of "limit of refractoriness," the authors next refer to the methods and value of the determination. One of the first methods used was an indirect one. It consisted in mixing pure quartz sand with the clay to be tested, and determining the proportion of sand necessary in order that the test-piece should run down to a liquid at the same temperature as a standard clay. This was not satisfactory. Bischof then adopted standard clays as a means of comparison; but as the standard clays were not available to others, Seger adopted mixtures of silica and alumina, &c.; forming the mixture into "cones" or small pyramids. The most modern method is to expose the clay to the high temperatures obtainable in the electric furnace; and it is claimed that it gives a much more accurate result than the use of the Deville furnace and Seger cones as standards. No direct comparison, however, has been made between the two methods. One does not necessarily want to know the limit of refractoriness in thermometric degrees. There are influences other than temperature to be taken into account when considering the probable behaviour of clays in actual practice. Furnace gases, dust, and the time factor enter into the question. It was said that the minimum of refractoriness was cone No. 26, and the maximum, it is worth while noting, is about No. 36, which is the figure for pure kaolinite—quartz being nearly as high. Fire-clays having a refractoriness equal to cone No. 35 are very scarce, and consequently somewhat high in price. The value of the factor of the behaviour of clay in fire is in the information it affords as to contraction and expansion at various temperatures. This is more particularly useful to the manufacturer.

METROPOLITAN WATER (CHARGES) ACT, 1907.

By George Kebbell.

(*Continued from p.* 235.)

The more one looks into the Act, the greater is the astonishment felt at the indefiniteness of the various terms employed, and which are at times absolutely shipshod. For instance, the word "consumer" has been introduced for the first time in any Water Act. "Consumer" is an expression used in discussing matters relating to water supply, and doubtless is meant to refer to the occupier of the house. Strictly, it would mean the person who actually used or consumed the water. But having introduced the term, one would have expected to find a definition of it; for a few words interpreting its meaning would have prevented many difficulties which will occur whenever it is necessary for the Courts to decide some point arising under section 30. This provides that a notice to the Board from a "consumer" for the discontinuance of a supply of water shall not be of any effect unless it be in writing signed by, or on behalf of, the consumer, and be left at, or sent by post to, the office of the Board. This section is an amendment or explanation of section 71 of the Water-Works Clauses Act, 1847, which provided for the "occupier" discontinuing the supply. It might fairly be argued that "consumer" meant "occupier," though, even if that be so, it seems difficult to understand why the word "occupier" is not again used. However, without some artificial meaning being placed upon the word "consumer," how can it be contended for a moment that consumer includes the owner? Therefore, where the owner is liable, the section will be inoperative; and it has been decided that the owner's liability is no greater than that of the occupier under section 71 referred to. But over and above all this, the section is bewildering, for the reason that by section 71 the liability of the occupier who removes in the middle of a quarter without giving any notice, either verbal or written, comes to an end automatically on the last day of that quarter.

The reference in the section to "the office of the Board" is also characteristically vague. Nowhere is there an enactment requiring the Board to have a Head Office, which is presumably what is meant; and unless the consumer could have access to a London Directory, he would utterly fail to discover where the Head Office was—for, extraordinary as it may seem, such Head Office is not anywhere disclosed in the Board's demands or receipts. If the "Office" is to mean any office of the Board, then there are nearly 100 different places to which the notice might be sent. All this might have been made quite clear by the addition of a few simple words.

Looking back forty years or so, it is curious to note how little benefit has been derived by the community or even the Water Companies (into whose shoes the Board have stepped) from the various statutes from time to time passed, doubtless with the best intentions. Take for example the Water Companies (Regulation of Powers) Act, 1887. Put in a few words, this took away from the Companies the right to cut off for non-payment where the owner was liable for the rate, and made such rate a charge on the premises. Absolutely an Act of confiscation, it was, curiously enough, passed by a Tory Government. The power to discontinue the supply when they could not get paid, was the natural right and remedy of a water company; just as a tradesman can refuse to sell his goods on credit. In fact, one is almost disposed to think that if the company or authority selling water were on the same footing as the tradesman and unprotected, and (what is more) unhampered by any special legislation, it might be better for all concerned. Particularly would it be so for the consumer, provided such company or authority were like the ordinary trader, subject to competition. As regards this Act of 1887, the effect of it has been to greatly embarrass the old Companies and the present Board, and has also occasioned at times great hardship to the occupier who has paid his water-rate to the owner in the shape of rent.

Another and earlier Act which missed fire was the Water-Rate Definition Act, 1885, and which was the outcome of the decision in Dobbs's case. Shortly, this Act made the poor-rate assessment the standard in the Metropolis, and was really passed to interpret the decision in Dobbs's case. However, the Legislature could scarcely have contemplated that the rateable values in the Metropolis were, as regards at least 40 or 50 per cent. of them, under £20, and that in respect of such houses the landlord was liable for the water-rate, and naturally collected it from the occupier in the shape of rent. The effect of this Act of 1885 was to reduce the water-rate some 20 per cent. Therefore, an owner of a hundred £20 houses would pay £20 a year less to the Water Company in respect of such houses. But who has ever heard of an owner taking less rent by reason of this reduction in the water-rate? The occupier who it was intended should be benefited by the Act derived no advantage whatever therefrom; and the owner, the last person the Legislature intended to relieve, was the only individual who reaped any gain by the Statute.

M. Borias on Gas Manufacture.—We have received from M. Edmond Borias, General Manager of the Compagnie Provinciale des Eaux, du Gaz, et de l'Electricité and of the Gaz Réunis, the second edition of his "Traité de la Fabrication du Gaz," the first edition of which appeared in 1900. We hope to notice the work more fully in a subsequent issue; but meanwhile it may be mentioned that the contents have been revised by the author in collaboration with M. Marcel Frechou, and brought up to date. The book is published by M. Charles Bérenger, No. 15, Rue des Saints-Pères, Paris.

A Sunrise and Sunset Chart.—We have received from Messrs. B. Gibbons, jun., Limited, and Gibbons Bros., Limited, of Dudley, a mounted coloured diagram showing the actual time of sunrise and sunset at any period of the year. Black vertical lines represent weeks, and horizontal lines hours. The top and bottom portions of the diagram, coloured blue, represent the number of hours of total darkness, which is a constant throughout the year; and the portions immediately above and below the blue, and coloured red, represent the length of time (varying from day to day) during which gas engineers have to meet demands. The middle portion of the diagram is intended to show the hours of daylight, and its centre shows, of course, the longest day. It is pointed out, in an explanatory note underneath the diagram, that as the demands of the public are governed, to a certain extent, by the variations of temperature, this should be borne in mind. It should also be noted that there is an appreciable difference between the length of dawn and twilight in summer and winter, and allowance made for it.

Gas Coal Contract Renewals.—In the course of an article on "Coal Contract Renewals," the "Iron and Coal Trades Review" last Friday said: "The general demand [for coal], both for export and home consumption, is by no means so bad as it is represented to be in some interested quarters; and in view of the high wages paid to miners at the present time, and the increased cost of production in other directions, there is no likelihood of any serious collapse in prices at present. The gas companies, always cautious and wily operators, are seeking to secure substantial reductions, and appear to be playing a waiting game; while Sir George Livesey publicly ridicules the suggestion of 10s. for best Newcastle gas qualities, although the Commercial Gas Company are reported to be offering 9s. 9d. to 10s., as against colliery prices of 10s. 3d. to 10s. 9d. It is to defeat the machinations of the gas companies that the Gas Coal Federation is taking action; and it is fully expected that the collieries will unite in insisting upon an advance of 2s. or perhaps 2s. 6d. per ton upon 1906 prices, which, to speak frankly, is really a reduction of 1s. or thereabouts on last year's figures, which represented an increase of 3s. to 3s. 6d. upon those of the immediately preceding year."

WORKMEN'S COMPENSATION ACTS.

By THOMAS BERRIDGE, of Leamington.

[**A Paper presented to the Southern District Association of Gas Engineers and Managers, March 12.**]

My object in this paper will be to set out as plainly and concisely as possible the liabilities of the proprietors of gas-works to their employees at the present day; but I shall make no attempt to suggest how these liabilities can best be met, beyond mentioning the various ways in which companies can protect themselves, as it seems to me this is a matter for each individual concern.

Before proceeding to consider the far-reaching Act of 1906, it may be well to remind you that it in no way affects the liabilities of a company under the Employers' Liability Act of 1880. This Act, however, only applies to injuries occasioned by—

1. Defective ways, works, machinery, or plant not discovered owing to the negligence of the proprietors or some person entrusted with the duty of seeing that the ways, works, machinery, and plant are in proper condition.
2. The negligence of a person entrusted with the superintendence of the workmen.
3. The negligence of a person to whose orders the workman must conform and does conform.
4. An act or omission done or made in obedience to rules or bye-laws of the proprietors or any person delegated by them to make rules, and resulting from some impropriety or defect in such rules.

In any of the above cases, unless the workman knew of the defect which caused his injury and failed to give notice of it, the workman has (or if the injury results in death his personal representatives have) the same right of compensation and remedies against the proprietors as if the workman had not been in their employ.

The amount of compensation recoverable is not to exceed such sum as may be found to be equivalent to the estimated earnings during three years preceding the injury of a workman in the same grade.

Under this Act notice of the injury must be given within six weeks, and the action must be commenced within six months, of the accident causing the injury, or, in case of death, within twelve months from the time of death, unless in the latter case the Judge before whom the action is tried is of opinion that there was reasonable excuse for not giving the notice.

It will be observed that, under this Act, the workman who meets with injury, or his representatives, only has or have the same right of compensation against the employer as if the workman had not been a workman of the employer; so that the employer is entitled to use any defence which he could use if he were being sued by one of the public.

The defence most commonly relied upon are—

1. That the act causing the injury was committed wilfully.
2. That when the injury was occasioned, the workman was not acting within the scope of his employment.
3. That the injury was unavoidable or not caused by negligence.
4. That the injured person was guilty of negligence which contributed to bringing about the injury.
5. That the injured person voluntarily took the risk of that which caused the injury.

This was the condition of things as regards statutory liability down to the year 1897, when the Workmen's Compensation Act of that year was passed, and the liability of employers in respect of accidents enormously increased. As, however, that Act is now repealed, except as to accidents which happened prior to the 1st of July last, it is unnecessary to go further into it.

By the Workmen's Compensation Act of 1906, which came into operation last July, the liability of employers in respect of accidents to their employees is further enlarged; and I propose to deal with the Act under the following heads: (1) The persons in respect of injuries to whom the proprietors are liable. (2) The accidents in respect of which compensation is payable. (3) The amount of compensation to be paid. (4) The method of dealing with claims. (5) The methods by which owners of works may protect themselves against their liabilities under the Act.

THE PERSONS IN RESPECT OF INJURIES TO WHOM THE PROPRIETORS ARE LIABLE.

Practically every man or boy employed—that is to say, who has entered into, or works under, a contract of service or apprenticeship—within a gas-works, except the much-envied officials who are not engaged in manual labour and whose remuneration exceeds £250 a year, are within the Act, even men employed for an occasional day or half-day, inasmuch as, although their employment is casual, they are employed for the purpose of the business carried on.

In addition to the liability to those immediately employed at a gas-works, there is also the liability in the first instance, subject to the right to be indemnified, to the men employed by persons contracting with the company. The section of the Act dealing with this is somewhat ambiguous in its terms, and at first sight would seem only to refer to sub-contracting in the ordinary sense of the term. But, on closer inspection, there would appear to be little doubt that if the owners of the works (say) entered into a contract for the erection of a gasholder and one of the contractors' men was injured, that man would have the right either to claim compensation from the owners of the works or his immediate employer, the contractor; and if he chose the former, they would have to look to the contractor for an indemnity. With regard to this, I would just mention that under the rules to which reference will be made later, provision has been made for the person required to give the indemnity to be joined in the arbitration proceedings, so that he may be bound by the amount awarded to the workman. When entering into contracts, these provisions should be carefully borne in mind by the engineer of the works, inasmuch as, if the contractor was financially unsound, the owners of the works would have to provide the compensation and would probably find that, if insured under the Act for their own workmen, the policy would not cover this liability.

THE ACCIDENTS IN RESPECT OF WHICH COMPENSATION IS PAYABLE.

Compensation is payable in respect of any accident to a workman arising out of, and in the course of, his employment which causes either (*a*) death or (*b*) total or partial disablement for more than one week, unless it has been brought about by the serious or wilful misconduct of the workman himself. But even if there has been serious and wilful misconduct, and the injury results in death or serious and permanent disablement, the workman's personal representatives, or the man himself, as the case may be, are or is entitled to compensation. So that if a man employed at a gas-works chooses to get intoxicated, and while in that condition is instrumental in bringing about an explosion which results in his being killed or permanently and seriously disabled, not only will the owners have the privilege of making good the damage done to their works, but they will also have to compensate the man or (in the event of his death) his representatives.

The words "arising out of and in the course of the employment," were used for the first time in the Act of 1897, and have been frequently reviewed in the Courts. The meaning assigned to them and to other expressions common to both Acts will hold good under the new Act. In addition, disablement arising from certain industrial diseases mentioned in the Act is to be deemed an accident in respect of which compensation is payable; but as this had no particular bearing on the case so far as gas companies are concerned, it is only necessary for me to mention it.

If the disablement does not last fourteen days, no compensation is payable for the first seven; but if it lasts for fourteen days, compensation must be paid from the date of the accident.

THE AMOUNT OF COMPENSATION TO BE PAID IN THE CASE OF INJURIES RESULTING IN DEATH.

If the workman leaves any dependant wholly dependent on his earnings, the compensation is either a sum equal to his earnings during three years preceding the accident, or £150, whichever is the larger, but in no case more than £300; or if the workman had not been employed for three years, then the amount to be paid is 156 times his average weekly earnings during the time he has been employed.

The word "dependant" is given a much wider meaning than has ever before been assigned to it in this connection, and includes an illegitimate child or grandchild or, in the event of the accident happening to an illegitimate child, includes his parent or grandparent if they are wholly or partly dependent on his earnings.

If the workman only leaves dependants in part dependent on his earnings, the amount to be paid is such as may be agreed upon or, in default of agreement, as may be fixed by arbitration.

If the workman leaves no dependants, the cost of medical attendance and funeral expenses are to be paid up to, but not exceeding, £10.

If a workman who has died from injuries received while following his employment leaves (say) a widow dependent upon his earnings, and the widow claims compensation, but before the amount is settled dies, it has been decided that the widow's personal representatives can recover the amount.

If some time elapses between the date of the injury and the death of the workman, any compensation paid to the workman is to be deducted from the amount to be paid to his dependants.

In all these cases under the new Act, the sum awarded as compensation must be paid into the County Court and not to the dependants as before; and the Court is to invest, apply, or otherwise deal with the money in such manner as it thinks best for the benefit of the dependants. This, in my opinion, is a most desirable alteration, and one which I am sure will meet with the approval of all employers.

IN THE EVENT OF TOTAL OR PARTIAL INCAPACITY.

A weekly payment to the workman of 50 per cent. of his average weekly earnings during the previous twelve months has to be paid; and if he has not been so long employed, for any less period during which he has been in the employment of the same employer.

If a workman under 21 years of age is totally incapacitated, and his average weekly wages at the time of the accident were less than 10s. per week, he is to receive the full amount of his average weekly earnings; and if they were more than 10s. but less than

20s., he is to receive at least 10s. a week. And if the disablement lasts more than twelve months, the payment may be increased on the application of the workman to half the weekly sum which he would probably have been earning at the time of the application if he had remained uninjured, but in no case to more than £1 per week.

If, owing to the shortness of time the workman has been employed or the casual nature of his employment, it is impracticable to compute the rate of his remuneration, regard may be had to the amount earned by a person on the same grade employed at the same works.

In the case of partial disablement, the amount of compensation to be paid weekly is in no case to exceed the difference between the amount of the average weekly earnings of the workman before the accident and the average weekly amount he is earning, or is able to earn, in suitable employment after the accident, but shall bear such relation to the amount of that difference as may be considered proper.

The amount which a workman would have been capable of earning but for the accident cannot be taken into consideration.

The Method of Dealing with Claims.

In order to entitle the workman to compensation, the Act provides that he shall give notice of the accident as soon as practicable, and before he leaves the service voluntarily; and the claim must be made within six months from the time of the accident or date of the death. But the want of notice, or inaccuracy therein, is to be excused if the employer is not thereby prejudiced in his defence, or if the want of notice was occasioned by mistake, absence from the United Kingdom, or other reasonable cause.

It is easy to see that in many cases want of notice would considerably handicap an employer, owing to the impossibility of obtaining evidence which would have been available at the time the notice should have been given.

After notice of an accident has been given, the workman must, if required, submit himself for examination by a doctor provided and paid for by his employer; and if he refuses, his rights under the Act are to be suspended until the examination has taken place.

When the claim for compensation has been lodged it may be settled by agreement, in which case a memorandum setting out the terms of the agreement must be sent to the Registrar of the County Court for registration, and, when registered, can be enforced as if it were a County Court judgment.

If the agreement is for a lump sum, instead of for weekly payments, the agreement will not relieve the employer of his liability to make weekly payments until it has been registered; and in order to prevent agreements being made for lump sums which are unfair to the workmen, the Court is given power, if it think the agreement ought not to be registered—either (1) owing to the inadequacy of the amount of compensation, or (2) by reason of its having been obtained by fraud or undue influence or other improper means—to cancel the Agreement or make such order as it thinks just.

Failing agreement, a claim under the Act must be settled by arbitration in one of the following ways:—1. If a Committee representative of the employer and workmen exists with power to settle matters under the Act, then, unless either party objects in writing, the claim shall be settled by the arbitration of such Committee, or be referred by them to an arbitrator. 2. If either party does object or there is no Committee, or the Committee refers the matter or fails to settle it within six months, the matter is to be settled by a single arbitrator to be agreed on by the parties, or, if they cannot agree, by the Judge of the County Court sitting as an arbitrator, or by a single arbitrator appointed by the Lord Chancellor. A County Court Judge is empowered, if he thinks fit, to summon a medical referee to sit with him as an assessor.

Elaborate rules have been framed by five County Court Judges and approved by the Lord Chancellor for the conduct of arbitrations; but they are much too technical to be gone into in a paper of this description. I would merely mention that under these rules the owners of the works have the right to be represented in the arbitration proceedings by their secretary or any other officer in their permanent and exclusive employment.

Regulations have also been issued by the Secretary of State as to the duties and remuneration of medical referees. The Secretary of State has also made regulations as to examinations of a workman by a medical practitioner, under which it is laid down that where a workman has given notice of an accident or is in receipt of weekly payments, he shall not be required against his will to submit himself to examination except at reasonable hours, and, further, that after one month has elapsed from the date of the first payment of compensation, he shall not be required to submit himself for examination except at the following intervals: Once a week during the second month; once a month during the fourth, fifth, and sixth months; and thereafter once in every two months—except that if after the second month an application has been made to commute the payments, he may be required to submit himself to examination for the purpose of the settlement of the application.

If an employer thinks that a workman has completely or partially recovered, he may at any time, in default of agreement with the workman, apply to the County Court Judge or other arbitrator to stop or reduce the amount of the weekly payments; and in the same way a workman in receipt of compensation for partial disablement may, if the disablement increases, apply to the Judge or other arbitrator for the weekly payment to be increased.

Where compensation has been paid weekly for not less than six months, the employer has the right to have the payments commuted for a lump sum. If the disablement is permanent, the lump sum must be of such amount as would, if invested in the purchase of an immediate life annuity through the Post Office Savings Bank, purchase an annuity equal to 75 per cent. of the annual value of the weekly payments. In cases of partial disablement only, it is to be of such amount as may be settled by arbitration in one of the ways I have already alluded to. It is, of course, permissible to commute the weekly payments before the six months have elapsed, but by agreement only, provided the agreement has been registered with the Registrar of the County Court in the manner before referred to.

With regard to the question of the workman's condition and fitness for employment, a simple method is laid down in the Act for settling disputes. If the employer's doctor has examined the workman, and the employer within the next six days supplies the workman with a copy of the doctor's report, or if the workman has been examined by his own doctor and within the same period sends a copy of the report to the employer, the employer and workman may, if they cannot come to an agreement on the matter, make a joint application to the Registrar of the County Court to refer the question in dispute to a medical referee, and the Registrar will then instruct one of the medical referees appointed by the Secretary of State to examine the workman and give a certificate as to his condition, which certificate is to be conclusive.

Provision is also made in the Act for the workman whose employer becomes insolvent. The character and extent of such protection depend upon whether or not the employer is insured in respect of his liability under the Act. If so, in the event of the employer's insolvency, the workman can practically stand in his shoes and recover from the insurers the same amount that his employer, but for his insolvency, could have done; and in the case of bankruptcy or the winding-up of a company, compensation to the extent of £100 is made a preferential payment provided the bankrupt or company being wound up is not insured under the Act.

The only way of "contracting-out" of the Act which is allowed must take the form of a scheme of compensation agreed to between an employer and his workmen, or a majority of them, and certified by the Registrar of Friendly Societies; and, among other things, such a scheme must provide scales of compensation not less favourable to the workmen and their dependants than those contained in the Act. But no scheme is to be so certified which contains an obligation upon the workmen to join the scheme as a condition of their hiring or which does not contain provisions enabling a workman to withdraw from the scheme.

The Methods by which Owners of Works may protect themselves against their Liabilities under the Act.

These are: 1. By insurance. 2. By setting aside each year a percentage on the wages paid, as an accident fund.

Until, however, the Act has been in force for a much longer period, it is difficult to say which is the better system to work on. I think there can be no doubt that insurance, so long as the business is placed with a sound office, is the safer, but, at the same time, probably the more expensive. There is no doubt either that the insurance companies, in fixing their premiums, are allowing a pretty wide margin for the uncertainties of the Act. But after a few years' working, the probability is that they will re-adjust their rates. At present the tariff offices are charging 17s. 6d. and 12s. 6d. per £100 of wages paid to the different classes of gas workers, and 3s. for the clerical staff; while the non-tariff offices charge from 12s. 6d. to 10s. and 2s. for the clerical staff. Compared with these rates, it is interesting to note the experience of the Leamington Gas Company, the Sheffield Gas Company, and the South Metropolitan Gas Company.

In the case of Leamington, the Directors adopted a liberal policy, and since the passing of the 1897 Act they have allowed their workmen temporarily disabled half pay from the date of the accident; and during the ten years the cost has actually worked out at 6s. per £100 of wages paid.

At Sheffield, when the Act of 1897 came into force, the Directors set aside a sum equal to 6s. 8d. per cent. on the total wages paid to meet their liabilities under the Act; while, as a matter of fact, the amount actually paid in compensation in the ten years only amounted to 4s. 9d. per cent. Further, it is estimated that had the Act of 1906 been in operation during that period, the compensation payable would have been equal to 6s. 0·84d. per cent.

Of course, these are only two instances; but the period extends over a fairly long period. On the other hand, owing to some big explosion, a company or corporation working on this system might find themselves very severely hit.

In the case of the South Metropolitan Gas Company, in the year 1906 accidents only cost them 5s. 6d. per cent. on the wages that they paid, and the year is stated to have been quite an ordinary one. It is calculated by Sir George Livesey that an extra 1s. 6d. per cent. would have covered the additional liabilities imposed by the new Act; so that it would appear in all the above cases that the liability would be well covered by (say) 8s. per cent. on the total wages paid.

At Edinburgh, the average cost per cent. on the wages paid has been as low as 2s. 9d. But in that case the Corporation would

appear to have been exceptionally fortunate in the small number of accidents; and I am afraid it would be unwise to attach too much importance to that figure.

Both the South Metropolitan and the South Suburban Companies have adopted schemes which have been certified by the Registrar of Friendly Societies, and which will remain in operation until the year 1913. It may be of interest if I briefly refer to the main features of these schemes.

In the first place, the schemes provide for the establishment of a "Co-Partnership Committee," consisting of 36 members, of whom 18 are workmen elected by ballot and 18 other members elected by the Board; and this Committee administers the funds. Further, in order to encourage the desire to prevent accidents, the rules provide that whenever the accidents at any particular station in any half year are at the rate of 55 per 1000 employees, every employee shall pay in advance 1d. a month for the next half year; when the accidents are between 40 and 55 per 1000, 1d. for each two months; and when the accidents are under 40 per 1000, 1d. per quarter only.

The benefits, as the Act requires, must on the whole exceed those obtainable under the Act.

Another feature of the schemes is the provision for summoning juries of twelve workmen to inquire into accidents. Not only are the jury to consider the cause of the accident, but how in their opinion a similar accident can be avoided in the future, and also whether any blame attaches to any official or workman, or whether the plant, machinery, or means of protection were defective. Under these schemes a claim can be made after three days disablement. The stability of the schemes is guaranteed by the Companies.

There is no doubt that there is much to be said for schemes of this sort, as the workmen have a special inducement to try to prevent accidents; but in the case of small companies, the risks would be too great to be taken by the company, as, if a serious explosion took place, they would not be able to stand the loss. It occurs to me that if small companies think it desirable to adopt similar schemes, in order to secure the benefits undoubtedly occurring therefrom, they would be well advised to do so, and could no doubt insure their risks under the schedule.

I have only attempted in the foregoing paper to outline, in ordinary language, the liabilities of the owners of works under the Acts of Parliament at present in force with regard to injuries to their workmen; and so much has already been written on the subject that most, if not all, of what I have said must be already known to the majority of those present. The matter is one, however, of such extreme importance to all of us that I trust I may be forgiven if I have succeeded in making the provisions of the Acts a little more plain to any of the members present.

LONDON AND SOUTHERN JUNIOR ASSOCIATION.

Professor Lewes on the Mantle.

There was a crowded attendance of members of the London and Southern District Junior Gas Association at the Cripplegate Institute, E.C., last Friday, to hear Professor Vivian B. Lewes lecture on the "Theory of the Incandescent Mantle;" and a thoroughly enjoyable and highly instructive evening was spent.

As is his custom, Professor Lewes set out with the evident intention of making everything as clear as possible to his audience; and to this end, he began right at the beginning. There were on view specimens of early burners. The first was the *fleur de lys* or cockspur, which gave a little over 1½ candles per cubic foot of gas consumed. This was later improved into the cockscomb burner, which furnished a light not very far removed from that of a flat-flame burner—it was close upon 2 candles per foot. Next came the batswing burner; and in 1820, Neilson, of Glasgow, made the union-jet burner, which still in some places would be found to be popular among certain people. After this, there was something like thirty years spent in finding out small facts about burners. These were of importance; but there was no striking departure for getting any greater light from the gas. In 1853, there was another step forward, when Dr. Frankland at the Royal Institution showed an argand burner fitted with two glasses, which gave a considerable amount of regeneration. The extra temperature of the flame thus secured increased the candle power to about 3½ candles per foot; but the burner was not a success, because there were no chimneys which would properly stand the conditions. In 1879, the idea was perfected by Siemens; and then there were the Wenham, the Sugg, and the other regenerative burners, which gave about 6 candles per cubic foot. It was possible to make regenerative burners giving 10 candles per foot; but the heat was so great that the burner was generally ruined in the course of a few weeks, so that they were confined to about 6 candles, under which conditions they lasted very well. After this period, nothing happened until 1882, when there was the idea of an incandescent mantle or basket for gas, made of little rods of magnesia; and within some ten years, Welsbach had found out the real way to make a mantle successfully. Since then incandescent gas-lighting had never looked back. Thus things had progressed from the 1½ candles of the cockspur burner to the 20 candles of the incandescent burner—under high pressure, of course, the candle power was greater.

Going over the history of the incandescent light, Professor Lewes began with the discovery of the lime-light in 1826—which started the idea of obtaining light by incandescence. Attempts were then made to light the streets of Paris on the incandescent system; little buttons of zirconia being used, in conjunction with a very small jet of coal gas, which was fed with a much smaller jet of oxygen blown into the centre of it. The light was fair; but the cost was prohibitive. In 1835, Talbot made an experiment in which he showed that if lime were in a very finely-divided condition, the heat even of a spirit-lamp would be sufficient to raise it to incandescence. Again there came a lapse of several years, when another step forward was made by Gillard, in France, who was using water gas, and who introduced the "blow" and the "run." He wanted to employ his water gas for light as well as heat, and made a mantle of platinum wire, which fitted over a tube from which the water gas was issuing at a high pressure. He got a good result at first; but after a short time the mantle ceased to emit light, owing to the metal becoming eroded by the gases. Long before the Welsbach invention, Sellon brought out a really beautiful platinum mantle, which looked as though it were going to be a tremendous success; but the same erosive action cropped up again, and could not be avoided.

Until 1852, said the lecturer, there was no flame, except the spirit-lamp and water gas, which was non-luminous. The spirit-lamp flame was very poor in heat; and the water-gas flame was not a general commodity. The discovery made by Bunsen in that year, of the burner bearing his name, was really the basis of the success that had attended incandescent lighting. It was the same laboratories of Heidelberg which gave the world the bunsen burner, that afterwards gave it the incandescent mantle, because it was there Welsbach first thought of using lanthanum for lighting, but was not successful. He then tried other substances; and ultimately came forth the mantles covered by the patent of 1885, which were extremely fragile, and gave a light of about 6 candles per cubic foot. Further researches led to the discovery that 99 per cent. of thoria and 1 per cent. of ceria was the mixture that gave the best mantle—the mantle which to-day, under the most favourable conditions, furnished a light of 20 candles per cubic foot of gas consumed. Welsbach found that if he took thoria alone and purified it, the more it was purified the less light it gave. If it was quite pure, he got about ½ candle per foot of gas; but by adding 1 per cent. of ceria to the thoria, a wonderful light-giving power was imparted. How, asked Professor Lewes, was this? A mantle of pure thoria or pure ceria would give no light; but with a thoria mantle and a small addition of ceria, the light-giving power went up enormously. With pure thoria, there was (say) ½-candle power per foot of gas; with ½ per cent. of ceria added, 15 candles; and with 1 per cent. of ceria, the climax was reached of about 22 candles. Then by continuing to add ceria, the light went down, but more slowly than it had previously gone up. With 2 per cent. of ceria, one obtained about 18 candles; and with 3 per cent., 15 candles; and so on.

An immense amount of research work had been carried out to determine the question he had asked, continued Professor Lewes; and the theories practically resolved themselves into those of catalytic action or dual oxidation on the one side, and a pure temperature effect on the other. Dr. Bunte and Mr. Swinton had carried out various experiments which threw aside the pure temperature effect theory, and brought the choice down to the two others. Then there had never been anything brought forward to prove that dual oxidation was the correct theory. This left the third theory of catalytic action; and that some such action undoubtedly took place with the Welsbach mantle, he said, could be proved by experiment. The lecturer then fixed a mica chimney over the mouth of a large bunsen burner, so as to form a prolongation of the tube, and lighted the mixture of gas and air at the mouth of the chimney—regulating the air supply to give a non-luminous flame. He then hooked an ordinary Welsbach mantle by its loop on to a stout platinum wire, and held it in the burning mixture of gas and air at the mouth of the chimney, where it glowed and emitted light in the usual way. Then he lowered it down through the flame into the mica chimney below, when it continued to incandesce for an appreciable time in the cold current of gas and air. It was, he remarked, quite clear from this experiment that the catalytic vigour of the incandescent mantle was sufficient to keep it incandescent in the mixture of gas and air without the exterior heating of the flame. The action was one which it seemed to him impossible to ignore.

This did not, however, said Professor Lewes, touch one of the most important points, which was why the 1 per cent. of ceria made all the difference it did in the light-giving effect. In a thoria mantle, emitting no light, there was a very high temperature, and small heat radiation; while in a mantle of pure ceria, there was a low temperature and great heat radiation. When they came to add ceria little by little to the thoria, they found the cooling effect of the ceria at once began to make itself felt; but this ceria had a most marvellous power of radiation. The thing that limited them to putting in 1 per cent. of ceria was this wonderful power. If they could secure a higher temperature flame, they could put in a greater proportion of ceria. To sum up, he said that the theory of the incandescent mantle was partly catalytic, and partly owing to the remarkable powers of ceria as a heat radiator.

Before concluding, Professor Lewes made a few remarks about mantle manufacture itself. He pointed out that the earlier mantles were all made of cotton. They gave excellent illumination at first, but soon began to fail; their useful life being often limited to 400 or 500 hours. At that time, he was doing a large amount of work on mantles; and he came to the conclusion that one of the things that was making the mantle structure very weak, and at the same time lessening its life, was that this cotton fibre was extremely tightly twisted. At that time (about 1895), there were many people trying to get round the Welsbach patents. De Mare, in 1894, had taken out a patent for making mantles of artificial silk, which was now largely manufactured from collodion. He had the idea of saturating this mixture of collodion with thoria nitrate and ceria nitrate; but unfortunately he forgot to state in his specification that it should be denitrated. However, about the same time another patent was taken out, which said the mixture should be denitrated; and by this means really very beautiful mantles were made, which lasted a great deal better than the cotton ones. They were the "New Sunlight" mantles. The fact that they lasted longer and gave a better light was important; but the expense of making them was so high that it really did not pay to do so. The structure of the mantle was, however, the point that struck him in the first place. The fibre employed was in a far less twisted condition; and efforts were made to find some way in which a structure could be obtained akin to the collodion structure, which should have the same effect. Then it was found that ramie answered extremely well; and most of the mantles now were made of it. The only further advance in the structure of the mantle which had been accomplished, was made by the Plaissetty Company, under the patent of Mr. Terrell, in connection with what were termed "mercerized" mantles—cotton or ramie mantles soaked, and then, instead of being burnt off as nitrates, first impregnating them in strong ammonia, and converting the nitrates into hydrates, which made a much denser form of ash filament afterwards. This gave greater strength, and had the advantage of enabling the mantles to be sent out practically in an unburnt condition. The mantle was much denser, and the shrinkage was not so great, and it moulded itself well to the shape of the flame—especially the inverted form. This would be an important point. Professor Lewes concluded his remarks on this branch of the subject with a series of lantern slides.

On the conclusion of the lecture,

The President (Mr. W. Upton) proposed a hearty vote of thanks to Professor Lewes. He said there was nothing so well calculated to give one an interest in his business as a knowledge of the inner workings of it. It was well to realize that nothing stood still in these days; and the fact that the mantle seemed to have done so for some few years, did not mean it had reached finality.

The Senior Vice-President (Mr. W. J. Liberty), in seconding the vote, mentioned that he had quite recently had brought to his notice an inverted high-pressure burner which, with a consumption of 10½ cubic feet of gas, gave a light of 663 candles, or between 60 and 70 candles per cubic foot. Thus a two-burner lamp would give a light of 1326 candles; and with gas at 2s. 5d. per 1000 cubic feet, the inclusive cost would be (say) £13 a year, which would compare very favourably indeed with the oriflamme arc at £17 10s.

Mr. W. Grafton supported the motion, and said he would have liked to have heard a little bit about the catalytic action with regard to the inverted mantle. He did not quite grasp why it was they got a better result from a small inverted mantle than from a larger upright one. Then, again, the composition of the gas was changing from day to day; and it would contain varying percentages of the different constituents, which tended to influence the result on the mantle. One day perhaps they might get a good effect; and the next day the gas would not be quite the same, and they could not expect to secure a similar result.

Professor Lewes, in returning thanks, said it had been a great pleasure to him to see so many members of the Association present at the meeting. As to Mr. Liberty's remarks, they would all of them welcome with open arms a mantle that would give anything like the candle power he had mentioned. With regard to Mr. Grafton's query on the subject of the inverted mantle, he thought this was a strong argument in favour of the catalytic theory. He fancied, if one had methods delicate enough to prove it, that it would be found there was a better mixture of air on the surface of the inverted than the upright mantle. The inverted mantle had come to stay; and they would find that in the future it would be the incandescent mantle. The upright would be only used for certain specific purposes for which it was best suited. The inverted burner lent itself admirably to decorative effects, and gave excellent results.

Mr. Liberty said he ought to have explained that the new inverted burner to which he had referred worked at a pressure of 4 inches of mercury or about 54 inches of water.

Before the members separated, the President announced that next Saturday the Association would visit the South Suburban Gas-Works, Lower Sydenham.

At the recent annual meeting of the Wrexham Gas Company, Mr. John Bury, one of the retiring Auditors, stated, in acknowledging his re-election, that he was the first Secretary of the Company when it was formed nearly seventy years ago, and had been connected with it ever since.

SULPHATE OF AMMONIA MANUFACTURE.

DESCRIPTION OF SULPHATE OF AMMONIA PLANT WITH CLAUS' SULPHUR-RECOVERY PLANT AT THE WREXHAM GAS-WORKS.

By Mr. Owen Evans, of Wrexham.

[A Paper read before the Midland Junior Gas Engineering Association, at Birmingham, March 14.]

Prior to manufacturing sulphate of ammonia, all the ammoniacal liquor produced at the Wrexham Gas-Works had been sent by rail to a chemical works to be worked up. The railway siding being on the opposite side of the town to the gas-works, the liquor had to be carted through the principal streets in large mounted barrels, and emptied into tank-waggons on arrival at the siding. About two years ago, the Borough Sanitary Inspector came to the conclusion that the carriage of this liquor through the streets was a public nuisance, and informed the Company that the cartage would have to be done at night or early in the morning, or that it should be carted through side streets. To adopt either of these suggestions would have caused much inconvenience and extra expense. It was therefore decided to stop the traffic altogether by installing a sulphate of ammonia plant on the works.

The plant was erected by Messrs. C. & W. Walker, Limited, and has a capacity of about a ton of sulphate per 24 hours; and as our make of sulphate for last year was 114 tons, the plant was only in use for about 114 days. Therefore, in order to work the plant economically, good storage capacity is essential.

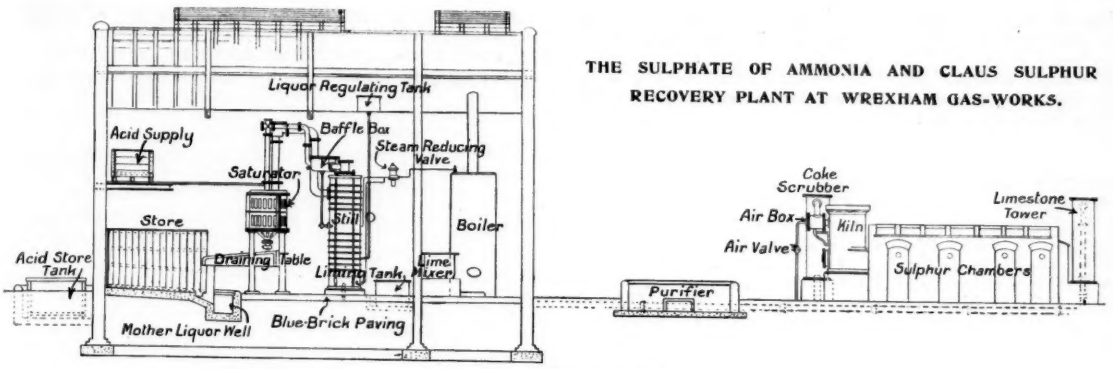
Before describing the plant, a brief description of the method of handling and working-up the crude ammoniacal liquor may prove interesting. The virgin liquor, or products of condensation, are collected in an underground tank at the foot of the condenser, from which tank the tar is pumped into an overhead loading tank; while the liquor overflows, or is pumped, into a second underground tank, having a capacity of about 30 tons. From this tank the liquor is circulated through the tower scrubber and worked up to a strength of 5° to 5½° Twaddel. It is then pumped through the lower tiers of a Walker purifying machine and tar-separator into a third underground tank, having a capacity of about 25 tons. From this tank it is transferred, as required, into a high-level air-tight tank of similar capacity, from which it passes by gravitation to the liquor regulating tank in the sulphate house; and the manufacture of sulphate is commenced when the last three tanks mentioned are filled—the quantity of liquor then in stock being about 80 tons.

Sulphate Plant.

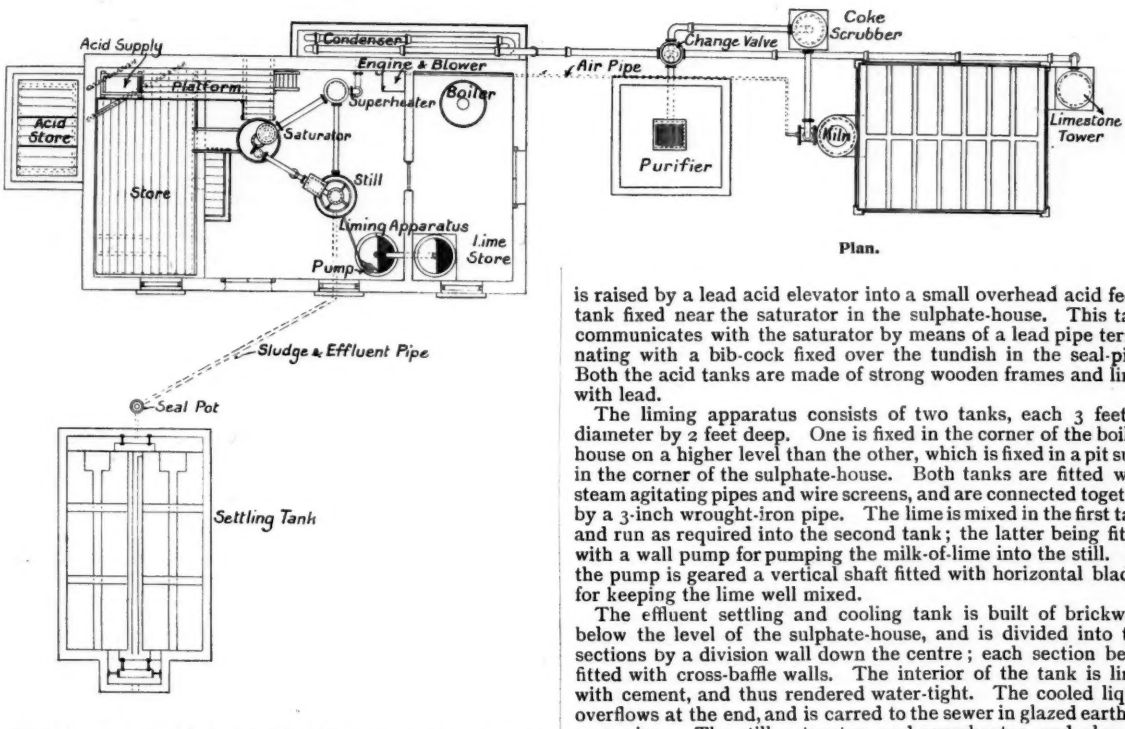
The sulphate and boiler houses are in one continuous building, divided by a 9-inch partition wall, the dimensions of the building being 41 ft. long, 20 ft. wide, 17 ft. high to the underside of the tie beam. The capacity of the vertical boiler is 14-H.P., and is suitable for a working pressure of 80 lbs. per square inch. It is fed by a small donkey pump. The superheater, which economizes steam by heating the liquor to the boiling-point before it enters the still, by means of the waste gases from the saturator, is 2 feet internal diameter by 5 ft. 6 in. high, and is fitted with 2-inch diameter vertical steel tubes, the ends of which pass through division plates for separating the liquor from the waste gases; the inlet and outlet flanges for the latter being 6 inches diameter. The still is cylindrical, and of the continuous type, 3 ft. diameter by 11 ft. high, and consists of a central liming chamber, having five tiers of shallow trays above and seven tiers below, with an outlet liqour chamber at the bottom. All the trays are fitted with inverted serrated edged hoods and liquor overflows. In the upper tiers the free ammonia is driven off; the liquor entering the still at the top and overflowing from tier to tier into the liming chamber, into which a small stream of milk of lime is continuously pumped. The liquid in the chamber is heated and thoroughly agitated by means of a steam jet. From the central chamber the limed liquor overflows through the lower tiers, and the fixed ammonia is liberated. The main steam supply enters at the bottom chamber and makes its way to the top of the still through the serrated edged hoods of each tray, and, blowing through the liquor, gives it a thorough boiling. The effluent liquor passes out of the still at the bottom and through a deep seal-pot into the settling and cooling tank, and thence into the main sewer. The ammonia and other volatile compounds pass out through a pipe at the top of the still, which is fitted with a cast-iron baffle-box for arresting any aqueous vapour passing from the still into the saturator; any liquid arrested being conveyed back to the liming chamber by means of a ¾-inch pipe. The gases evolved pass into the saturator, which is charged with sulphuric acid kept at a strength of 58° to 60° Twaddel, and with which the ammonia combines, forming sulphate of ammonia. The main steam supply pipe to the still is fitted with a pressure-gauge and steam reducing valve; the working pressure on the still being 10 to 12 lbs.

The saturator is of the self-discharging type, 3 ft. in diameter by 3 ft. 6 in. deep inside, with conical base well, at the bottom of which is fitted a Howell's patent gun-metal discharge valve. The body, base well, and cover are formed of special cast iron, supported upon three columns 6 ft. 6 in. high; and the cover is provided with 3-inch and 6-inch diameter branches for the ammonia inlet and waste-gas outlet respectively, and has a 12-inch manhole in the centre. The saturator is lined internally with pure chemical sheet lead, 16 lbs. per foot; and the outside

THE SULPHATE OF AMMONIA AND CLAUS SULPHUR RECOVERY PLANT AT WREXHAM GAS-WORKS.



Sectional and Side Elevation.



Plan.

cast-iron sides are provided with suitable holes to allow for the proper expansion of the lead. Suspended from the manhole in the centre of the cover is a lead curtain or seal-pipe, fitted with acid-feed tundish. The internal portion of the ammonia pipe is of 3-inch diameter lead, and coils around the interior of the saturator just above the conical base well; the coil being perforated for distributing the ammonia.

The waste gases pass out of the saturator through a 6-inch diameter cast-iron pipe, at the top of which is fitted a baffle-box for arresting any acid that may be carried forward by the waste gases, and then through the superheater, for preheating the liquor before it enters the still. From the superheater the waste gases are passed through a horizontal pipe condenser, the lower part of which is fixed in a water-trough; and above the condenser is a water spray. The products of condensation—"devil liquor"—are drained through a seal-pot into a cast-iron tank, from which they are pumped into the superheater for recirculation and recovery of the sulphuretted hydrogen. From the condenser the gases pass through a water-seal change valve, either directly through the purifier or first through the sulphur-recovery plant and then through the purifier, as desired. The purifier is 10 feet square by 2 ft. 6 in. deep, formed of concrete and brickwork, and is fitted with sieves arranged in the form of a box, over which oxide of iron is placed in a conical heap.

The sulphate, when formed, precipitates to the base well of the saturator, and is discharged on to a timber draining table lined with lead; the "mother liquor" draining into the mother-liquor well, which is sunk in the floor below the draining table, and at the foot of the sulphate store. The mother liquor is raised into the saturator as required by means of a ½-inch lead elevator. The sulphate store is 20 ft. by 10 ft., and is covered with lead, which is carried 2 feet up the sides and ends of the store; a channel being provided to drain the mother liquor into the mother-liquor well—the floor of the store being inclined for this purpose. The sides of the store are further protected with match-boarding, and the floor with rough flooring boards, laid on battens 2 feet apart.

The acid storage tank has a capacity of about 6 tons, and is fixed in a pit sunk outside the sulphate-house. For use, the acid is raised by a lead acid elevator into a small overhead acid feed-tank fixed near the saturator in the sulphate-house. This tank communicates with the saturator by means of a lead pipe terminating with a bib-cock fixed over the tundish in the seal-pipe. Both the acid tanks are made of strong wooden frames and lined with lead.

The liming apparatus consists of two tanks, each 3 feet in diameter by 2 feet deep. One is fixed in the corner of the boiler-house on a higher level than the other, which is fixed in a pit sunk in the corner of the sulphate-house. Both tanks are fitted with steam agitating pipes and wire screens, and are connected together by a 3-inch wrought-iron pipe. The lime is mixed in the first tank and run as required into the second tank; the latter being fitted with a wall pump for pumping the milk-of-lime into the still. To the pump is geared a vertical shaft fitted with horizontal blades, for keeping the lime well mixed.

The effluent settling and cooling tank is built of brickwork below the level of the sulphate-house, and is divided into two sections by a division wall down the centre; each section being fitted with cross-baffle walls. The interior of the tank is lined with cement, and thus rendered water-tight. The cooled liquor overflows at the end, and is carred to the sewer in glazed earthenware pipes. The still, saturator, and superheater, and also the sulphur kiln, are specially coated with Fossil meal composition to prevent radiation of heat. The actual working costs for 1907 were as follows:—

	Per Ton of Salt. £ s. d.
Wages (manufacture)	0 11 1
Acid—16½ cwt.	1 13 8
Lime—5 cwt.	0 4 0
Repairs (wages and materials)	0 3 5
Coke—16 cwt.	0 8 10
Cartage	0 1 3
Gas	0 0 11
Liquor (estimated) 11 tons 15 cwt.—5° Twaddel	5 10 1
Licence	0 0 6
Interest on capital, at 5 per cent	0 10 2
	£9 3 11

Claus' Sulphur-Recovery Plant.

When this plant is in use, the waste gases from the condenser are dried by passing through a coke scrubber, 2 feet diameter by 9 feet high, at the top of which a thermometer is fixed to ascertain the temperature, which must not exceed 70° Fahr. The waste gas then passes into the air and gas inlet box, fixed at the top side of the kiln, where it is mixed with air; the theoretical proportion of the mixture being about 2½ parts of air to 1 part of sulphuretted hydrogen. The air is pumped into the box by means of a blower coupled direct to a small steam-engine fixed in the sulphate-house; the air-pipe being fitted with a relief valve, a pressure-gauge, and a quadrant cock for regulating the air supply. The kiln is a cylindrical wrought-iron vessel 3 ft. 4 in. in diameter, by 6 feet high, lined throughout with fire-brick, and having a fire-brick grate upon which is first placed a layer of broken bricks, and then a thick layer (about 3 feet deep) of hydrated ferric oxide. At the top is fitted a loose cover, the joint of which is made with luting, and at the bottom front side is a large manhole for keeping clear the passages to the depositing chambers. The mixed gas and air pass down through the mass of oxide of iron, and the oxygen of the air combines with the hydrogen of the sulphuretted hydrogen forming water, and the

sulphur combines with the iron of the oxide forming iron sulphide, which is immediately reoxidized by the air. The reaction takes place with such rapidity that the mass of oxide becomes incandescent. When, however, the oxide is at a red heat, the mixture of gas and air will be decomposed according to the following equation:—

$$H_2S + O = H_2O + S.$$

The sulphur liberated is volatilized by the heat and passes into the depositing chamber. The depositing chamber is built of ordinary brickwork, with the exception of the portion nearest the kiln, which has a fire-brick lining. The roof is covered with slate slabs, and doorways have been let in the side walls at intervals, for clearing out the sulphur when necessary. In the interior of the chamber are a series of transverse baffle walls, which retard the flow of the sulphur vapour and other gases passing through from the kiln. The sulphur is condensed in solid form and deposited on the walls of the chamber; the other gases passing out through a limestone tower, and thence through the oxide purifier. If too much air is admitted into the kiln, a portion of the sulphur is burned to sulphur dioxide; and if an insufficient supply of air is passed in, a portion of the sulphuretted hydrogen will remain undecomposed. Any sulphur dioxide passing through is arrested in the limestone tower, and sulphuretted hydrogen in the oxide purifier. In a paper read by Mr. Kynaston in 1893, on the waste gases of the Chance-Claus sulphur-recovery process, he states that the yield of sulphur is undoubtedly greater when sulphuretted hydrogen predominates to the extent of 9 grains of sulphur in this form to 7 grains as sulphur dioxide per cubic foot of permanent gases escaping. The limestone tower is 2 feet in diameter by 9 feet high, and is filled with unburnt limestone. It is fitted at the top with a water spray.

In a small plant of this description it is practically impossible, owing to the small quantity of sulphuretted hydrogen to be dealt with, to recover the whole of the sulphur; and in practice it is found that a slight excess of air has to be passed through in order to keep the heat up in the kiln. The quantity of sulphur escaping as sulphur dioxide, as treated in the last portion of the chambers, is from 11 to 16 grains per cubic foot, with a very slight trace of sulphuretted hydrogen. The plant was installed not so much for the recovery of sulphur as for the decomposition of the sulphuretted hydrogen. The plant requires very little attention; and the expense on it up to the present has been practically *nil*. The sulphur chambers have not yet been cleared out; so that I cannot say what quantity of sulphur has been produced.

Discussion.

Mr. A. W. Twine (Birmingham) asked Mr. Evans why he did not put in the table the cost of bagging. He took it the cost of £9 3s. 11d. was just as the salt was turned out from the plant. Surely he should add something for labour in bagging, the cost of material, &c. Then with reference to the air admitted in the sulphur-recovery process, the author said: "If too much air is admitted into the kiln, a portion of the sulphur is burned to sulphur dioxide; and if an insufficient supply of air is passed in, a portion of the sulphuretted hydrogen will remain undecomposed." What method had they of gauging the proper amount of air?

Mr. C. G. Langford (Coventry) remarked that sulphate of ammonia manufacture was always of interest to those connected with the gas industry. In fact, it seemed to be the recognized way of utilizing the ammoniacal liquor. He did not know why this should be so, and thought gas engineers could with advantage turn their attention to the manufacture of carbonate of ammonia, or even pure ammonia. The processes would not be complicated; and he thought they would lead to an increased revenue. He asked if Mr. Evans had experienced any difficulty with the Howell discharge-valve, or whether he considered it satisfactory; and he also said it would be interesting to know what percentage of the total ammonia in the Wrexham liquor was fixed, as 5 cwt. of lime per ton of sulphate certainly seemed to be a high figure. With reference to the Claus sulphur-recovery plant, he was very sorry indeed that Mr. Evans could give them no figures in regard to the working of the plant. He gathered it was installed not so much from a commercial standpoint as to effectually dispose of the sulphuretted hydrogen. Would not the easy method of passing the effluent into oxide of iron have been just as efficacious in accomplishing this?

Mr. A. O. Jones (West Bromwich) remarked that one or two points had occurred to him in connection with the paper. In the first place, with regard to the sulphuric acid, he noticed the author said this was kept at a strength of 58° to 60° Twaddel; whereas one generally read that the acid used was about 140° Twaddel. He would be glad to know whether the author found he got a better salt by using a weaker acid. With reference to the table of cost of manufacture, Mr. Evans gave the price of the liquor as £5 10s. 1d. He took it that this figure was what he could obtain for the liquor if he sold it to a chemical manufacturer for treatment away from the works. In that case, the difference between the price obtained for the sulphate and the total cost given represented the advantage in price obtained by manufacturing sulphate on the works compared with selling the liquor to a chemical manufacturer.

Mr. A. S. Foster (Long Eaton) asked what form of pump was used for liming. In the works where he was, the liming arrangement was unsatisfactory. The pumps got fixed up with grit, especially when the lime was gritty at all. With regard to the 58° to 60° Twaddel strength of the acid, had Mr. Evans ever used any other strength? He did not quite follow the method of checking the amount of liquor running through the still. The liquor regulating tank looked very small. Was it filled (say) once each hour or every two hours?

The President (Mr. W. E. Caton, of Derby), after proposing a hearty vote of thanks to Mr. Evans for his paper, said he should like to mention one or two points. At his (the speaker's) works, they used acid of 146° Twaddel, which was 80 per cent. acid, and they required 17¾ cwt. per ton of salt; whereas the author said he used 16½ cwt. The theoretical calculation for pure acid per ton of sulphate was 14·2 cwt.; and therefore Mr. Evans must use, he took it, a much higher Twaddel than was employed at his (Mr. Caton's) works. Was bagging included in the wages of manufacture, or in the wages and materials of repairs, or was it not down at all? He would like to say that it would be much preferable if people, when giving a table of sulphuric acid working, would show the costs in a similar manner to what Mr. Evans had done, but show also what they received for the sulphate of ammonia. The difference would be what they would receive for the ammonia in the gas. They would then be able to work it out at so much per unit, and compare it with the amount received when the ammoniacal liquor was sold to chemical manufacturers. Then 11 tons 15 cwt. of liquor at 5° Twaddel seemed to be rather a small quantity. At his own works, they did not reckon it at much under about 12 tons.

Mr. J. H. Willoughby (Leamington) seconded the proposition, and remarked that the paper gave an illustration of getting out of a difficulty by turning it to commercial advantage.

The vote having been carried by acclamation,

Mr. Evans acknowledged it, and proceeded to reply on the discussion. With respect to the questions asked as to the cost of bagging, he said they sold the sulphate in buyers' own bags, and, of course, this came off the price received. The amount they received per ton of sulphate sold was £10 16s. 5d. If they debited the bagging against the expenditure, they would have to credit the receipts with the amount. With reference to the quantity of air passing to the sulphur kiln, they arrived at this experimentally. The gases in the chambers were tested, and the air was regulated accordingly. The less sulphur dioxide there was passing, the better the plant worked. With reference to the Howell valve, they had had no trouble at all with it—it worked very satisfactorily. The quantity of fixed ammonia in the liquor was high; and this accounted for the large amount of coke and of lime used. The fixed ammonia averaged about 40 per cent. of the total ammonia in the liquor. With regard to the strength of the sulphuric acid, this, of course, had to be weakened in the saturator. They found it best to use 58° to 60° Twaddel. They had tried it higher; but the salt did not dry when drained off. The price of the liquor was what they had previously received for it; and the quantity was arrived at as the result of tests made. The regulating tank was very small; and it was fitted with a ball-valve. It filled up; and when full, the ball-valve shut the liquor off. As, of course, the liquor ran out, the valve allowed more to come in. The strength of the acid was between 148° and 150° Twaddel.

Mr. Jones: Do you dilute your acid?

Mr. Evans: In the saturator.

Mr. Jones: 60° Twaddel represents the acid and the mother liquor.

Mr. Evans: You get better salt with weak acid.

Mr. Joseph Evans, the principal partner and Chairman of Directors in Messrs. Joseph Evans and Sons, Limited, the well-known pump makers, of Wolverhampton, whose death was recorded in the "Journal" for the 11th ult., left £176,141.

The result of the experiments in light visibility conducted by Germany and the Netherlands, working in association, are given as follows: A light of 1-candle power is plainly visible at one mile, and one of 3-candle power at three miles. A 10-candle power light was seen with a binocular at four miles; one of 29 candles at five miles, though faintly; and one of 33 candles at the same distance without difficulty. On an exceptionally clear night, a white light of 3·2-candle power could be distinguished three miles away, one of 5·6 candles at four miles, and one of 17·2 candles at five miles. The experiments were made with green lights; but it is stated that red lights of the same intensity can be seen at greater distances.

The theory of the radiation of the Auer incandescent gas-mantle is discussed by M. Foix in the February number of the "Journal de Physique." It is generally admitted that mantles owe their brilliancy to their selective radiation, which appears, according to the researches of Professor Rubens, to be brought about by the addition of a little oxide of cerium to oxide of thorium. M. Foix now comes to the conclusion that the luminous efficiency of mantles can be increased by carrying the dilution of the oxide of cerium in the oxide of thorium a further stage; the result being brought about by the diminution of the infra-red radiation of the mantles; and a consequent incease of their temperature. The best proportion of the oxides appears to be 1 of cerium to 100 of thorium.

SCOTTISH JUNIOR GAS ASSOCIATION.

WESTERN DISTRICT.

A Meeting of this Association was held in the Technical College, Glasgow, on Saturday evening—the PRESIDENT (Mr. W. Wilson, of Falkirk) in the chair. There was a very large attendance of members.

The PRESIDENT intimated that the Secretary (Mr. G. Braidwood) had received a report from the Secretary to the Conference of Junior Gas Associations recently held in Birmingham, and remarked that there had really been no point of importance finally settled at the meeting. There was nothing which required discussion by them. There were a number of points which they had settled for themselves; and the Council had agreed to allow the report to lie on the table.

PRODUCER GAS.

This was the subject of a paper read by Mr. F. MELLOR, of Glasgow. In the course of it, he said that producer gas had recently been the subject of innumerable articles in the Technical Press, and of papers read before scientific societies; and it could not be questioned that much greater interest was now being taken in this gas than had hitherto been done. The commercial success of almost every industrial enterprise largely depended on the economical use of fuel, and, allowing that the process of combustion was now more clearly understood than it was formerly, there was still much room for improvement before the heat utilized in performing work was anything near the heat energy in the fuel employed. If they took, for instance, the use of solid fuel in any operation demanding a uniformly high temperature for its successful completion, it was very rarely that more than 50 per cent. of the heat in the fuel was utilized; the rest being lost by radiation, imperfect combustion, excess of air, and the high sensible heat of the flue gases. The classic researches of Joule had put in their possession the fact that 2545 B.Th.U. were equivalent to 1 H.P.H. How far they were from this ideal position might be gauged when they heard that the best steam-engine still required approximately six times this quantity of heat, in the form of coal, before it would give 1 B.H.P.H.; and manufacturers should not complain if their new gas-engine required three times the theoretical amount of heat, as gas-engines were by no means common which had a thermal efficiency of 33 per cent.

Mr. Mellor said it was not his intention to deal exhaustively with the difficulties encountered when trying to burn solid fuel in an economical manner, or to go into details to prove the obvious superiority of gaseous fuel over direct firing. Suffice it to say that the loss of heat was much greater in the latter system than in the former; and the higher the temperature required in the process, the greater would be the ratio of heat lost by the solid, as compared with the gaseous, fuel. Theoretically, a far greater efficiency should be obtained by the use of solid fuel than by the same weight of fuel converted into gas. In order that this might be better understood, they must suppose they were dealing with pure carbon and oxygen, instead of with coke and air. One kilogramme of pure carbon, if burnt to carbon dioxide, would give 8080 calories; whereas if an equivalent weight of carbon were first converted into carbon monoxide, and then burnt to carbon dioxide, the heat evolved would be 5630 calories—showing an approximate loss of 2450 calories. The conversion of solid into gaseous fuel was thus apparently attended with a loss of 33 per cent. of the total heat of the fuel. In gas-producer practice, however, the sensible heat evolved by the formation of carbon monoxide was absorbed by decomposing steam blown in with the air, by which the loss of heat was considerably reduced.

An ordinary producer usually consisted of a vertical circular steel casing, lined with fire-bricks, in which a stream of air and steam was either drawn or forced through a bed of incandescent fuel. The oxygen in the air combined with the carbon in the fuel to form carbon dioxide, which at once yielded up half its oxygen to a further portion of carbon, and formed twice its own volume of carbon monoxide. When the steam came in contact with the incandescent carbon, it was split up into its elements—oxygen and hydrogen. The oxygen combined with the carbon in the same way as the oxygen of the air; and the hydrogen remained as a permanent gas. The composition of the resulting gas was: CO, CO_2, H_2, N, and CH_4 (small quantity). The function of the gas-producer was to convert the whole of the combustible matter in the fuel into combustible gas; and the nearer the ratio of heat in the gas was to that in the fuel from which it was produced, the higher would be the efficiency of the apparatus. Gas-producers might be divided into two classes—pressure producers, or those where the blast was forced into the bed of fuel, either by means of a jet of steam, fans, or rotary air compressors; and draught or suction producers, in which gasification was carried on by a blast drawn into the producer by a partial vacuum, created by natural draught, fans, or the out-stroke of a gas-engine.

The author then proceeded to describe, by the aid of the screen, the construction and working of various types of gas-producers; beginning with the Bischoff producers, erected in Germany in 1839, by Hatty. The other types shown or described were: the Ebelmen, built in 1840; the producer made by Gustav Eckman, a Swedish ironmaster, in the year 1845; Beaufumé's producer, erected at Cherbourg in 1856; the Siemens (1857, and introduced into this country in 1861); the Hundin, erected at Carlstad, in Sweden, in 1863; and the Minary and Wilson producers, in 1876 and 1882. Among the best-known modern producers were, he said, those of Dowson, Duff, Mond, Morgan, and Talbot. The Dowson producer was the first to be applied to the manufacture of gas for power purposes. The Duff producers had for many years enjoyed a well-earned reputation in steel-works in the West of Scotland, where large batteries had been employed for generating gas for melting purposes. Bye-products plant was introduced by Dr. Ludwig Mond in 1882. In 1898, Mr. Duff, the well-known producer-gas specialist, erected a bye-products plant at the Fleetwood works of the United Alkali Company, and since then plants of the Mond and Duff types have been put up in almost every part of the civilized world. This was not surprising to those who were intimately acquainted with the working of the plants, for the rate of gasification, the quality and the quantity of the gas produced, and the yield of sulphate of ammonia, could be controlled within fine limits. With careful management, 70 per cent. of the nitrogen in the coal could be recovered as sulphate of ammonia; and this, combined with the high thermal efficiency of the plant, made it a very profitable investment where large volumes of gas were required for heating or power. A description of the working of bye-products plants was given, including that erected by the Glasgow Gas Power and Bye-Products Company at the works of Messrs. W. Beardmore and Co. at Parkhead; and also of the Ritchie, Thwaite, Jahns, and Mason and Boutillier producers.

FIRE-BRICKS AND RETORTS.

Mr. E. M. STEWART, the Manager of the Bonnyside Fire-Brick Works of Messrs. James Dougall and Sons, Limited, at Bonnybridge, read again the paper he read on the occasion of the visit of the members of the Association to the works on Jan. 26, 1907, and noticed in the "JOURNAL" for Jan. 29, 1907 (p. 284). On that occasion, discussion of the paper was postponed.

The PRESIDENT explained that Mr. Stewart had kindly offered to re-read his paper on account of the length of time which had elapsed since he brought it forward, as well as for the benefit of those members who had not heard it. Both papers would be discussed together.

Discussion.

The PRESIDENT, referring to Mr. Mellor's paper, said the question of producer gas was an all-important one to the gas industry, more especially to those connected with the actual processes of gas manufacture. He would be very glad if the members would put forward any new ideas they might have with regard to the plant for making this gas. It must be exceedingly interesting to those who were working with such enormous quantities of gas to get so large a quantity of ammonia. One thing which had troubled him for a number of years with regard to the application of producer gas was why the gas industry did not adopt either Mond gas or some other gas like it, made from bituminous small coal, for heating retorts. They invariably employed coke for the purpose; and they endeavoured to use the best coke available. Would it not be better to substitute for this coke, worth 10s. or 12s. per ton, dross which they could get for 7s. per ton? If they obtained 90 lbs. of sulphate of ammonia from it, they would have their fuel for practically nothing; and they could then sell all the coke which came from the retorts. So far as he could make out, there would be no trouble in what he was suggesting, except in taking out the tar and in the inconvenience of having another gas-making plant to handle. He thought it was worth experimenting upon. When they saw that in steel-works they could melt steel with this poor gas, he saw no reason why they should not be able to heat retorts in the same way. They were pleased to have heard Mr. Stewart's paper again; and he (the President) was sure they were all at one with him in thanking the author for re-reading it.

Mr. A. H. WHITELAW (Glasgow) said he was greatly impressed with the views of producer-gas plant which Mr. Mellor had shown; and if there was one thing more than another of which the paper had convinced him, it was that the lower the percentage of steam passed through the producer, the better was the quality of the resulting gas. He had always been led to understand, partly from calculations he had himself made, and partly from reading in the Technical Press, that the proportion of steam should never be more than about 50 per cent., and, indeed, that it was better to be a good deal less—say, as low as 40 per cent. The ideal producer was one in which no steam at all would be used. But everybody knew it was impossible to have this, because the producer would get so very hot; and the introduction of steam was necessary to keep it cool, as well as to assist in breaking-up the clinker. He should like to quote figures which he gave to the Association two years ago in regard to the percentage composition of producer gas at Provan, which he thought was very good. It was: CO, 31; H, 9; CH_4, 1; CO_2, 2; N, 57. When they considered that the greatest possible amount of carbonic oxide they could get in a theoretically perfect producer was 33 per cent., they must agree that 31 per cent. showed a very efficient producer; and this was the apparatus Mr. Mellor had described as one of the best on the market. Another thing in which the author had greatly pleased him was the point to which the President had referred—as to what might be called the regenerator way in which producer gas might be used with bituminous coal for the recovery of sulphate, although he had had no experience of this sort of plant.

Mr. J. M. Popplewell (Glasgow) remarked that though he had not had any practical experience in the use of producer gas, or in the application of it, it occurred to him that it must be interesting to anyone connected with an industrial concern, because in the present day producer gas met with such a number of applications in various branches of work. He supposed producer gas must, in itself, form rather a severe competitor with coal gas, in these days when suction producer plants had become so popular. He gathered from what Mr. Whitelaw had said that he considered it would be better if they could do without steam in producers. The only functions which he indicated it served were the keeping of the producer cool and the breaking-up of the clinker. Perhaps he lost sight of the fact that a valuable gas was generated at the same time—viz., hydrogen, which had a high calorific value, higher, he believed, than that of carbonic oxide. Not only this, but by getting up the carbonic oxide to 33 per cent., and keeping down the steam, they had a large proportion of inert gas—nitrogen. Mr. Whitelaw said there was 57 per cent. of nitrogen in Provan gas. He (Mr. Popplewell) did not say Mr. Whitelaw was wrong; but it occurred to him that by using more steam and less air they would have less of this inert gas (possibly 40 per cent. of nitrogen), 28 per cent. of hydrogen of a very high calorific value, and possibly from 20 to 30 per cent. of carbonic oxide. He should also like to add his meed of praise of Mr. Stewart's paper.

A vote of thanks having been accorded to both authors,

Mr. Mellor and Mr. Stewart acknowledged it; the latter remarking that it was one of the strange things in fire-brick making—the reason for which was not known—that bricks fired with producer gas, at a higher temperature than coal-fired bricks, were much softer, and could be cut much more easily; and anyone who had had experience in setting ovens knew the difficulty there was in cutting bricks so as to make a tight joint.

The proceedings then terminated.

A Princess's Invention.

A paragraph appeared in some of the London papers last Wednesday to the effect that Princess Stéphanie, daughter of the King of the Belgians, had taken out a patent for a new kind of gas-stove. We learn from "La Chronique" for the 12th inst. that the primary object of the stove, which is stated to be of elegant appearance, is to keep warm, upon the sideboard of a dining-room, the viands placed there in the course of dinner. It consists of a shallow dish, easily lifted from the framework, having under it a burner fed by some spirit, preferably alcohol. Beneath the burner is a plate to prevent the heat injuring the furniture upon which the stove may be placed; and surrounding it is a cup to catch any of the spirit spilled by an accidental shaking of the appliance when in use.

Gas-Mains and Steam-Rollers.

The Gaslight and Coke Company have sent a circular letter to the Metropolitan Borough and other Councils within their area of supply, referring to a recent case of gas escape due to the fracture of mains by the use of a steam-roller, involving not merely great waste of gas but injury to persons and loss of life. The Company express their anxiety to prevent accidents of this kind by co-operation with local authorities, and inquire whether the Councils would, through their officials, assist the Company by giving them written notice in all cases where it is intended to use a steam-roller, so as to enable the Company's officers to keep the roadway under special observation so as to detect damage more promptly, and thereby tend to avert calamity. They add that such notice would be regarded as a friendly notice only, and not affecting the legal position of either party. The letter is generally being referred by the Councils to committees for consideration and report.

A Safe Underground Cable Box.

At the Tipton works of Messrs. Bullers Limited, the well-known telegraph engineers, opportunity was afforded last Wednesday of inspecting a junction-box devised by them, in conjunction with Mr. E. J. Chambers, one of the Directors, which they claim is so ventilated as to make it impossible for an explosion to occur in it of such force as to be harmful. Among those who witnessed the experiments carried out to support this claim were Mr. G. F. L. Foulger, the Chief Distributing Engineer of the Gaslight and Coke Company, and Mr. Crabb, of the South Metropolitan Gas Company. The boxes were so arranged that an equal quantity of gas could be allowed to enter junction-boxes of the present Post Office pattern and those of the new ventilated pattern, with the result that when sparked a violent explosion occurred in the former, which spread to the others; but none whatever in the latter. Further experiments were then made with the ventilated boxes; but in no case was there an explosion. General satisfaction was expressed with the results of the experiments. If the invention renders impossible the serious explosions which have occurred in various towns within the last few years, it should be welcomed, not only by the actual users of underground boxes and the various gas companies, but also by the public generally.

FUEL AND ITS FUTURE.

At the Royal Society of Arts, on Monday last week, Professor Vivian B. Lewes, F.I.C., F.C.S., commenced a course of four Cantor Lectures on the subject of "Fuel and its Future." The following is an epitome of the first lecture, which was devoted to the subject of the formation of fuel.

Professor Lewes began by pointing out that coal—the earth's great store of heat energy—is a heritage of which the world only realized the importance a little more than a century ago; yet it was the distribution of this heritage that governed the fate of nations, that made great empires, and relegated other countries to more or less obscurity. A thousand years ago, it was the force of arms, of civilization, of arts, that made a nation great; to-day it is the force of fuel, which, by developing commerce, governs the distribution of power on the face of the globe. A century has passed, and Great Britain occupies a position that is a pride to her sons the wide world over. But in our elation we are too apt to overlook the fact that Nature has had quite as much to do with our supremacy as our own endeavours; and the Professor said he desired, in the course of lectures he was commencing, to discuss our methods of employing the great natural advantages we have enjoyed, and see how far it was in our power, by using our fuel supplies to the best advantage, to ward off that fatal day when, dependent upon other nations for our sources of energy, we must of necessity lose our pride of place.

The lecturer then went on to speak of the fuel question as being perhaps the most interesting and important of the many problems of the present day, not only because our methods of generating power from fuel are undergoing changes of the most radical character, but also because it is being slowly borne in upon us that we must have some thought for the future, and that the prodigal waste that has characterized our consumption of fuel in the past, and the fatal effect it is having on our atmosphere and our lives, must, in the interest of future generations, give way to more carefully considered methods of working. More than twenty centuries before the nature of combustion was understood, and the causes which led to the generation of heat by its aid were realized, it had been recognized that the burning of wood and dried vegetable matter could be utilized to eke out the warmth derived from the sun; while it was not until the Thirteenth Century that the employment of bituminous coal as a fuel was first attempted—its use being forbidden in 1306, owing to the horror created of the pollution of the atmosphere by its smoke. The gradually increasing shortage of wood and charcoal, however, the limited use of peat, and the necessity for a more abundant fuel, again brought the use of coal to the front; but the reign of Queen Elizabeth saw it still under a ban, for the same reasons as before. There was nothing else to use; and as the country was becoming rapidly denuded of timber, coal at last established itself, in spite of frequent protests, as our principal domestic fuel. The use of coal for the generation of power was of even more recent date. It was only in 1781 that the translation of heat energy into mechanical work was first satisfactorily solved by the invention of the steam-engine by Watt, and it was not till 1829 that Stephenson gave the world the locomotive.

The discovery by Lavoisier of the part played by the oxygen of the air in combustion, and his enunciation of the great truth that the heat evolved during the burning of a substance is due to the rapid evolution of energy during chemical combination, mark the last years of the Eighteenth Century as being the starting-point of our ideas on the true nature of this phenomenon. The great generalizations which underlie all processes of change, and which we know as the conservation of energy and of matter, teach us that no such powers as creation or destruction are vouchsafed to us, and that though we may change the form of matter to an almost endless extent, and translate one form of energy into any other, our powers are limited to these transmutations, and can go no farther. When we attempt to define the sources of energy available for the generation of power, we find we are limited to gravity, to muscular force, and to heat; and when, in turn, we seek the sources that give rise to these, we find the sun behind them all. Without sun, all would cease. The great factors in the storing of the sun's energy in such a form that it can be reproduced at will are those marvellous changes which take place during the growth of vegetation, and which over countless ages built up for us the accumulations of fuel which the past century has seen squandered with such a prodigal hand.

In the whole of Nature's wonder-book, there is nothing that appeals more to our sense of the marvellous than the way in which all the waste of animal and vegetable life is converted by decay into those simple compounds carbon dioxide and water vapour, which are again used in the wonderful processes by which all forms of life are synthetically recreated. It is the sun's rays which are the mainspring of this regeneration; and the growth of vegetation is the means by which it is brought about. All the ordinary forms of plant life in which the green pigment known as "chlorophyll" is present, owe their growth to energy derived from the sun, under which the chlorophyll contained in the small glands of the plant absorbs carbon dioxide and water vapour from the atmosphere, while more moisture and traces of mineral salts are drawn in by the roots. Once absorbed, the carbon dioxide and water vapour, under the influence of the chlorophyll, commence a marvellous series of changes, which

result in the formation of the first visible product, the starch granules and also sugars, which afterwards become practically the food of the plant, and are incorporated as the cellulose or woody fibre of which the solid portion chiefly consists.

Having referred to the attempts which have been made to use artificial light for hastening the growth of plants, the lecturer said the usual statement that the solid matter of the plant consists of cellulose is, of course, only an approximation to the truth, as cellulose is but one of several modifications produced by the actions taking place in the growth of the plant. But as, from a calorific point of view, the other organic bodies present have practically the same thermal value, it is a convenient simplification to take wood as being composed of cellulose, water, and the constituents of the sap, mineral salts, and extractive matters, which may be resinous, as in coniferous woods, extractive, as in beech or birch, or tannin, as in oak. The chemical actions which have resulted in the formation of the cellulose have required an expenditure of energy which, in the primary decomposition of the carbon dioxide and water vapour, can be expressed in terms of the heat necessary to raise a unit weight of water one degree. A unit weight of carbon in burning to carbon dioxide raises 8137 units of water 1° C., or 14,647 units of water to 1° Fahr.; and the former we speak of as calories, and the latter as British thermal units. In the same way a unit weight of hydrogen in burning to form water develops 34,500 calories, or 62,100 B.Th.U. In order to again decompose the carbon dioxide and water so as to liberate the unit weight of carbon and of hydrogen, just as much energy expressed in heat units will be absorbed; and as in the growth of the plant this energy has been derived from the sun, and has been partially rendered latent in the cellulose, when we burn this compound in the form of wood so as to again convert the carbon and hydrogen to carbon dioxide and water vapour, we once more set free the stored energy in the form of heat, and can render it available for heating purposes.

Professor Lewes next passed on to deal with the variations in the physical properties of wood, and to show how a fuel of practically double its value can be obtained by its conversion into charcoal before use. He explained that under the influence of destructive distillation, the contained moisture and combined oxygen are driven forth as water vapour; and though four-fifths of the weight of the wood is lost in the liquid and gaseous products escaping, yet the 20 per cent. of carbon that remains on burning is free from the drawback of having the intensity of the heat of combustion lowered by the rendering latent of heat which in the case of wood was lost in vaporizing the water and bringing about the decomposition.

The next subject taken up was the formation of peat, which the lecturer explained was apparently due partly to fermentation when exposed in its wet state to air, and partly to checked decay when covered with water; and he said it was the latter process which was the most valuable in converting it into a form available for fuel. He pointed out that enormous areas of peat exist at the present day, not only in the British Isles, but in even greater quantities in Russia, Sweden, Norway, Germany, and Finland, while in Canada and America the peat bogs are still more vast; and he expressed the opinion that in the future this material will probably play an important part in the supply of fuel, when the depletion of our coal supplies drives us to utilize these natural stores. The great interest, however, attaching to peat at the present moment is that the same action which converts cellulose into this substance will, if continued under conditions of considerable pressure and higher temperatures than ordinarily exist at the present day, convert the peat deposits into a coal seam. He remarked that the chemical actions which took place during the period when the peat deposits, heated from below by the earth's temperature, and pressed upon by the superincumbent deposits above them, underwent those changes in composition which we now recognize in our coal, can be traced by analysis. He gave a table, compiled by Mr. W. J. A. Butterfield, to indicate the way in which the gradual elimination of the hydrogen and oxygen altered the cellulose of the growing plant to the products of our coal seams.

Professor Lewes went on to show that it is not time alone which causes alteration in the character of coal. The factors of temperature and pressure also play so important a part in its composition, that it is unsafe to base any far-reaching ideas as to the age of a coal from the amount of natural carbonization it has undergone. He showed that any form of bituminous coal, subjected to a raised temperature, begins to yield products of a liquid and gaseous character; and if the temperature be kept at the lowest point at which any action can take place, the liquid distillates formed are of an oily character, and not greatly dissimilar to some crude mineral oils. Indeed, it seems highly probable that when the coal has been formed under conditions where no escape of gaseous matter could take place owing to the impermeability of the overlying strata, a natural distillation at very low temperature has gone on over long ages; and some of the bituminous products of the decomposition, distilling into the earthy strata next to the coal, have formed with it the shales, which differ from coal in this respect—that the fixed residue left on their distillation consists of earthy matter instead of coke.

Coming to the production of mineral oil, Professor Lewes remarked that the Pennsylvanian oil-fields yield crude oil consisting largely of members of the group of hydrocarbons known as the "saturated" series, the lower and more simple members of which are gases, and which with the fifth member commence to give highly volatile liquids yielding the pentane now used for our standard of light, and the hexane and heptane dear to motorists under the name of "petrol;" while higher members of the series constitute the burning, lubricating, and fuel oils which have played so important a part in the technical world during the past fifty years. The Russian oils, on the other hand, contain hydrocarbons of a slightly different character, having as important constituents "naphthenes"—a group which, though in many properties similar to the saturated hydrocarbons, yet in composition must be ranked with the unsaturated. So laborious, however, is the separation of the hydrocarbons present in these great natural distillates that our knowledge of their constituents is still far from perfect; and recent researches on the tars obtained at low temperatures from coal show that they are characterized also by the presence of the naphthene group.

The valleys of the Alleghany, which gave so abundant a supply of oil to Drake and the pioneers of the oil industry in the early sixties, also yielded that great output of natural gas which concentrated the manufacturing activity of America to so large an extent in these districts, and although found in small quantities in many parts of the world, no output of the same magnitude has ever been discovered.

The last subject to be dealt with was natural gas, which Professor Lewes characterized as by far the most valuable of the gaseous fuels; it being practically methane. Weight for weight, it is, in his opinion, the most valuable of all the fuels, having a calorific value of 12,008 calories (21,615 B.Th.U.). He remarked that its history affords a graphic object-lesson of what within a hundred years will be our condition with regard to coal supply. With the first discovery of natural gas, waste of the grossest character took place, followed by a period in which, the value of the gas having been realized, it was consumed with the utmost prodigality, and no thought was ever given to the future. Then, as reduced pressures in the supply began to sound a warning note, economy began to be exercised; while now the rapidly decreasing supply threatens failure at an early period, and has at length forced attention to every point at which economy can be obtained.

This brought the lecture to a close. Last night Professor Lewes dealt with the fuel supplies of the world, and emphasized the necessity for immediate economy in their use.

THE "BOCCIUS LIGHT:"

AN OLD-TIME PROPOSAL.

A correspondent forwards a copy of the "Illustrated London News" of Oct. 15, 1842, containing some particulars of an "improved light" that it may be interesting to put on record, together with a reproduction of the quaint wood-cut that was published two-thirds of a century ago—nearly seven years before the first number of the "JOURNAL" appeared.

The extract is as follows: We are generally disposed to look with considerable distrust on any new discovery or invention which comes recommended to us by a peculiarly outlandish designation; and we readily admit that this was the first impression we were susceptible of on opening the prospectus, commencing with the luminous and somewhat startling announcement, "Patent 'Boccius Light.'" On going through the document, however, we found that the invention derives its name from that of the patentee, who signs himself "Gottlieb Boccius;" and dates himself from Duke Street, in the Adelphi; and, certainly, if only half the advantages may be derived from its adoption which are set forth in the prospectus, Mr. Boccius's discovery would be well worthy the experiment. It is but justice, however, to the patentee to state that he has submitted his invention—which professes to effect an economy of 83 per cent. in the burning of gas, whilst in point of purity and brilliancy the intensity of the light is greatly increased—to the fairest tests and examinations to which scientific discoveries can be properly subjected. It is proposed to apply it not only to purposes of street illumination, but also to introduce it into churches, halls, public and private buildings, shops, manufactories, &c., &c.; and an experiment has been already made, on an extensive scale, to show its capacity for affecting the first-mentioned purpose, by the erection of a lamp in the Strand, opposite Northumberland House. If all that the patentee says of his invention be true, the advantages to the public will be great, and, therefore, we subjoin a sketch [p. 706] of the tasteful erection in the Strand, which may not be unacceptable to our country readers.

The lamp is cited as a practical specimen not only of the brilliancy, softness, and power of the light, but of its economy, and adaptation to this and other uses. It is found, in practice, to require about 90 cubic feet of gas per hour, which is equal to the consumption of about 16 or 18 common street burners, according to the usual contracts; whereas the light afforded, as ascertained by Messrs. Brande and Parkes, to whom it was submitted for examination, is equal to the concentrated effect of at least 100 such burners. Thus, six times the illuminating effect is produced by this single lamp, with the same quantity of gas, which is tantamount to an economy of 83 per cent. "It is therefore demonstrated" (says the prospectus) "that a hitherto unequalled degree of *space-penetrating power*, and of *local intensity of illumination*,

is to be procured by means of this invention, in places of great public thoroughfares. These important advantages are obtained without any increase of expense to parishes and ratepayers, as a number of common lamps, at least equal in cost of gas to a single 'Boccius Light,' may be dispensed with in such situations; and the public will gain the benefit of additional safety and convenience from the vastly increased amount of light. Lamps suitable to the illumination of areas of greater or less magnitude are constructed on the same principle, and with similar effects, according to the degree of power desired."

Without pledging ourselves ["Illustrated London News"] to the truth of all the details, we consider the invention of sufficient importance to demand a "fair trial." In explanation of the engraving, it may be necessary to state that the gas is supplied from the mains, passing through a meter placed at the top of the stone pillar. The weight of the lamp is 112 lbs.

Public Lighting of Nuneaton.—A report was presented by the Highways Committee to the Nuneaton Town Council at their last monthly meeting detailing negotiations which had taken place with the Gas Company on the subject of street lighting; the Company having given notice to charge 10s. per lamp more. The Committee recommended that electric lamps be substituted; and the Electricity Committee suggested that, in the event of the report being adopted, application should be made to borrow £6000 for the purpose of extensions. Alderman Sands, however, remarked that since the report had been prepared, the Gas Company had re-opened negotiations; and he asked that both reports should be referred back—which course the Council agreed to adopt.

The Serious Charge Against a Gas Official.—At the Maidstone Police Court, last Saturday, Herbert Kell Kindler, late Assistant-Manager at the Maidstone Gas-Works, was charged with obtaining £300 by false pretences from Mr. William Day, jun. The accused was brought before the Bench on the 3rd inst. (see *ante*, p. 651), and remanded. It was stated that he dealt in gas stocks and securities to the extent of £45,000 in six weeks, mainly through the North-Eastern Bank, at Stockton. From Feb. 5 to Feb. 21, cheques amounting to £6505 11s. were returned dishonoured by this bank. It was alleged the cheque was obtained from Mr. Day in exchange for one drawn on the Stockton Bank, which was subsequently dishonoured, by offering to invest money in debenture stock. Prisoner was committed for trial; but bail was allowed.

The Bankruptcy of Mr. Woltereck.—The Official Receiver has issued particulars in connection with the failure of Mr. H. C. A. L. Woltereck, whose public examination on the 3rd inst. was noticed in the "JOURNAL" last week. The debtor filed a statement showing gross liabilities amounting to £13,509, and net assets £14. The deficiency is £8183. Bankrupt, it may be remembered, was interested in the formation of the Dibdin-Woltereck Process Development Company, Limited, and the Cyanide Manufacturing Company, Limited. The former Company are at present negotiating for the sale of all their rights to a new company, and the latter went into liquidation in 1905. The debtor attributes his insolvency and failure to his inability to find sufficient capital for producing sulphate of ammonia, and to bring the Chemical Proprietary Company to a paying stage. The list of unsecured creditors contains some curious items. The creditors treated as partly secured are stated to hold as security for £11,100 money advanced, an overdraft of £413, and £23 for board and lodging, (1) 5250 shares in the Sulphate of Ammonia Company, Limited, (2) charges upon 17 shares in the Dibdin-Woltereck Process Development Company, Limited, and (3) books and wearing apparel. The deficiency account filed by the debtor is inaccurate, and he has been requested to amend it.

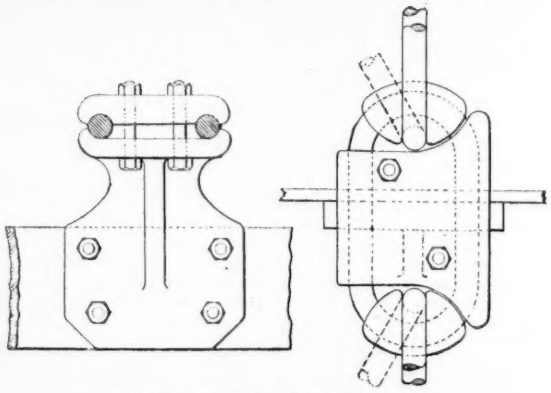
REGISTER OF PATENTS.

Conveyor Chains.

KEABLE, A. H., and DUCKHAM, A. M'D., of Bournemouth.

No. 2426; Jan. 31, 1907.

This invention has reference to conveyors of the kind which consists of a central oval link chain furnished at intervals with cross slats or push-bars which move and convey the substance along the trough part of the conveyor. Such chains are usually made with cast wearing blocks where the oval links embrace one another; the blocks being shaped so as to give a larger bearing surface to the ends of the links, and thus increase their wear. In conveyors of this kind as heretofore constructed, the cross slats or push-bars have been liable to get askew with the chain, and then the conveyor does not work properly; but the present invention provides means for fixing the cross slats or push-bars to the oval links of the chain, so that, under all circumstances when the conveyor is at work, the push-bars or cross slats will be rigidly fixed to the link and always be at right angles to it.



Keable and Duckham's Conveyor Chains.

As shown, the cross slat or push-bar is fixed to the oval link of the conveyor chain by a bracket which has a downwardly projecting web to which the push-bar or cross slat is fixed, and has also a horizontal top plate or member made with a groove in which one side of the oval link fits—this top part of the bracket being also shaped to bear against the other side of the link. On the top of the bracket there is a cap, which is made with a cross groove on its underside adapted to fit upon the side of the link that fits in the groove in the top of the bracket. The other side of the cap is made to bear against the other side of the link; so that, when the cap is fixed to the bracket, the link is clamped and gripped between the top part of the bracket and the cap, "which cannot possibly get askew with the link." In addition to the cap being fixed to the bracket, the outside of the cap is by preference made with a downwardly and backwardly projecting lip, which engages under the top part of the bracket, thus, with the fixing screws, "making the cap very secure."

Retorts for the Production of "Coalite."

PARKER, T., of Chapel Street, Edgware Road, W.

No. 4067; Feb. 19, 1907.

This invention relates more particularly for the production of a partially coked fuel under the conditions and in the manner described in patent No. 14,365 of 1906; and it has for its object "to provide effective means for the gas-tight closure of the discharging aperture of the retort used in the distillation, and to effect the closure from the top of the retort."

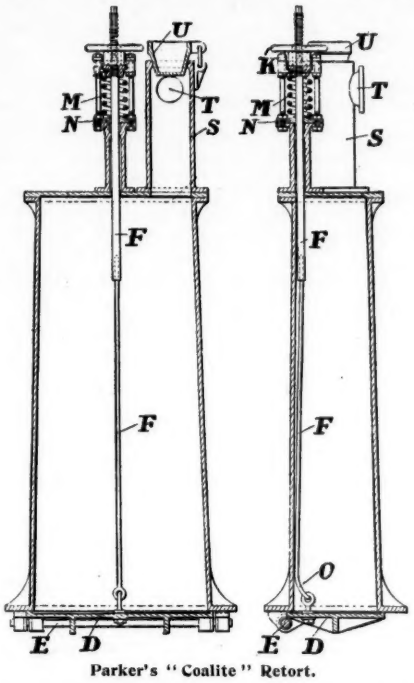
The retort or still provided according to this invention is shown in sectional elevations (p. 707) at right angles to each other.

As shown, the retort is of oblong section, and tapering uniformly from the charging mouth at the top (of relatively small cross sectional dimensions) to the discharging mouth at the bottom (of relatively large cross sectional dimensions). A hinged bottom cover plate D is provided to the retort, to close the discharging mouth and carry the charge. The plate is hinged loosely upon a spindle E carried on the under-face of the retort; and a rod F, passing up alongside one of the walls of the retort and operated from above, enables the lower plate to be lifted or lowered upon the spindle upon which it is mounted to hinge. The rod F passes through a stuffing-box upon the top cover plate; and the upper extremity of the rod has mounted upon it an operating hand wheel K, and a sleeve or collar against which a spiral spring M abuts, the opposite extremity of which abuts against the cover plate or gland N of the stuffing-box, and thus exercises pressure, tending to force the upper sleeve or collar and operating hand wheel K upwardly. The pressure thus imposed on the rotation of the screw for the purpose of lifting the lower cover plate D may be in fact transmitted through the spring M, and thus the lower plate may be closed by elastic pressure, and compensation provided for the contraction and expansion of the rod F.

The lower extremity of the rod F is preferably connected to the upper face of the lower cover plate at a point as nearly as convenient and effective to that side of the retort at which the lower cover plate is hinged; and the rod is diverted towards its lower extremity, as shown at O, so that it may pass up the retort in close proximity to the wall.

The charging shoot S is of cylindrical or other form, mounted upon the upper cover plate of the retort, and at the same time serving as an uptake for the gases and vapours generated during the process of

distillation, and which pass out through a "lateral hole" T, of which "two may be provided in opposite positions, so that when a number of retorts are mounted side by side in series they may be connected together with their outlets in line, and thereby the vapours and gases



Parker's "Coalite" Retort.

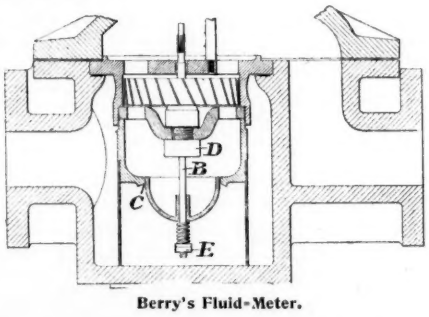
may discharge through the outlet of the retort at the end of the series or otherwise." A removable lid U may be mounted on the upper aperture of the cylindrical charging shoot, and is preferably provided with a conical face to correspond with a conical seat provided around the aperture.

Fluid-Meters.

BERRY, J., and METERS LIMITED, of Manchester.

No. 6808; March 21, 1907.

The patentees employ an inlet valve of hemispherical or like form, adapted to slide upon a central stem or guide stalk, provided at one end with a boss-like part, acting as a stop-piece for limiting the movement of the valve in one direction, while the other end is screw-threaded, and fitted with nuts and a spring, dash pot, or other equivalent device serving to sustain the valve. This is arranged so that it shall slide within the valve-way or aperture, and thus act somewhat in the manner of a piston-valve.



Berry's Fluid-Meter.

As shown, it is of substantially hemispherical form, and freely mounted on the central stem or guide-stalk B, enabling it to act in a piston-like manner within the valve-way which it controls. As the apex of the valve is disposed on the inlet side of the valve-way, ample area for the inflow of water is obtained with but a small lift or movement of the valve. The form of the valve and its piston-like arrangement with respect to its seating or equivalent part C also afford such a comparatively gradual opening and closing of the water-way on the opening and closing movements of the valve as will serve to prevent violent fluctuations in the flow. The upward or opening movement of the valve is limited by the abutment shoulder D on the central stem; while at the opposite end of the stem a nut E and a spring are provided, which limit the downward or closing movement of the valve and also sustain it.

Gas Lighting Apparatus.

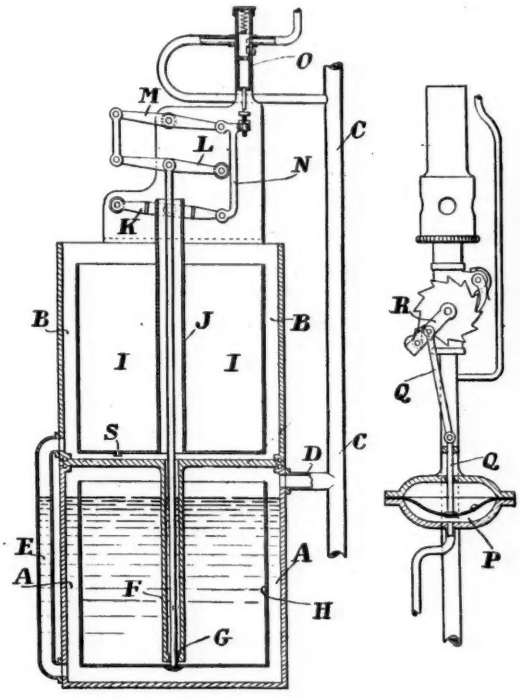
BROADBERRY, A. E., of Tottenham.

No. 7367; March 27, 1907.

This invention relates to apparatus for lighting and extinguishing gas-lamps by the establishing of the ordinary night pressure, or by temporarily increasing the pressure of gas at the works, or some station controlling the supply of gas to all the lamps or certain of them—each being provided with a bye-pass to the burner or other means for lighting, and thus dispensing with the usual method of turning on the taps or lighting each lamp separately by hand.

The main principle of the invention lies in the employment of two chambers having a rigid wall between them, or separate from each other, each in communication with one another in such a manner that, with the normal or gradual increase of gas pressure, liquid contained in a separate chamber, or in one or both of the two chambers, flows at an equal rate in each of them, and, in consequence, mechanism connected with them will not be operated to turn the gas-cock. But with a quick (intentional) increase of pressure, the action will be quicker in one compartment than in the other, and will in consequence operate the mechanism connecting, or positioned between, the chambers and the cock, so that the cock will be turned to establish or cut off the gas supply to the burner according to its previous position—a pilot light from a bye-pass or other means always being in readiness to light the gas when required. In all constructions, "the apparatus readily adjusts itself to existing conditions of pressure, and is always ready to act at any pressure, on the necessary quick rise being given, without any adjustment whatever or a predetermined height of gas pressure being attained."

The illustration shows the preferred form of apparatus. Two chambers A B are employed, one above the other. Connection from the gas supply pipe C, leading from the main to the burner, is made with the chamber A by a branch D, preferably situated at the upper part of the chamber. The lower parts of each chamber are connected by a pipe E. Depending from the plate which divides the two chambers, a tube F opens into both chambers; the lower end of the tube reaching well down into the lower chamber, and being provided at its end with a contracted or contractable opening G, so that the bore may be made small to retard the flow of liquid.



Broadberry's Gas-Lamp Lighter and Extinguisher.

In each of the chambers is an open-topped float H I; the latter being provided with a tube J passing through it from the bottom, and open at both ends. The lower float carries a rod, which passes through the tubes F J, the latter being pivotally connected with a rocking beam K, hinged to a bracket above the upper chamber. The rod is also pivotally connected to another rocking beam L, also hinged to the bracket, but on the opposite side to the other hinge. The bracket also carries a rocking beam M, connected at one end by a toggle link with the rocking beam L, and at the other end by a link N, with the rocking lever K. The object of this connection is to ensure that the floats act as counterbalances to each other; and as they move away from or towards each other, assisted by the liquid in both chambers, their effort is assimilated and combined.

The link N carries an arm, preferably provided with an adjustable screw stop which acts on a piston-valve situate in a cylinder O, connecting a branch from the gas-pipe C with a chamber P, provided with a flexible diaphragm carrying a rod Q, which passes through a guide fitted in the top of the chamber P. The end of the rod is pivoted to an arm R, loosely connected to the plug of the gas-tap controlling the burner, and provided with a pawl for engaging teeth of a ratchet-wheel rigidly fixed to the plug of the gas-tap. The plug casing also carries a pawl, which engages the teeth of the ratchet-wheel so as to prevent reverse motion.

The upper float is provided with a hole S, of a predetermined size or regulatable by any form of valve so as to allow the liquid to enter the float, as hereafter described. The chamber A and float H are supplied with glycerine, water, or the like.

With this construction of apparatus, the action is as follows: Supposing the gas be on and the burners lighted, the float I and diaphragm in the chamber P being down and the counter-balancing float H up, the gas will pass direct through the pipe C to the burner, but the gas pressure would have forced part of the liquid into the upper chamber B and into the float I, by way of pipes E F and holes S. Now, supposing

it is desired to extinguish the lamp, the gas is given a comparatively quick increase of pressure, which, passing through the branch D into the chamber A, acts on the liquid in it, and forces it up the pipe E in somewhat large volume into the chamber B, and in smaller volume up into the chamber A, through the small opening G—at the same time by its action pressing down the float H. As the water rises in the chamber B, it lifts the float I—a small portion passing through the hole S. This movement of the floats, due to the displacement of the water through the increase of pressure, will lift the lever N; and this lifts the piston and allows of the gas under the increased pressure to pass to the chamber P, and acting upon the diaphragm therein lifts it for its rod Q to turn the gas valve or plug, by the pawl engaging the teeth of the ratchet-wheel, and so shut off the gas supply to the burner.

When sufficient liquid enters the float I through the hole S, and sufficient leaves the float H through the hole G, the operating appliances resume their normal positions, because the float I, being normally slightly heavier and made still heavier by the weight of liquid which has entered it, will raise its counter-balance float H (made lighter by the liquid which has passed up through the hole in it), and the spring or its own gravity will bring down the piston valve, so that the gas under the diaphragm will be vented and allow the diaphragm to lower (by its own weight or otherwise) the pawl travelling over the teeth of the ratchet-wheel for a fresh operation.

To relight the burner, a repeat of the operations is performed by establishing again a comparatively quick increase of pressure, which in the meantime may have been slowly varied either up or down without affecting the apparatus, which constantly adapts itself to the varying conditions by the liquid equalizing through the holes G S. The appliances will not be actuated by a gradual increase of pressure, as, in such an event, the liquid will rise in the chamber B and fall in the chamber A slowly; and, in consequence, it will not operate the floats appreciably, because the liquid equalizes in each chamber and floats gradually through the holes.

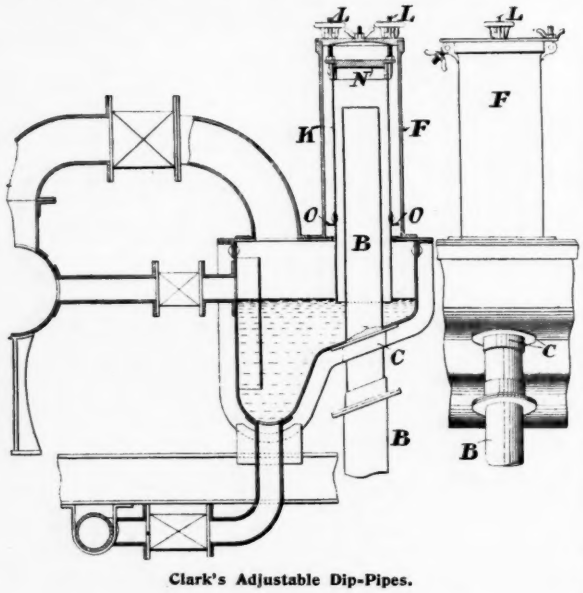
Several modifications of the arrangement above referred to are described and illustrated in the specification.

Hydraulic Main Arrangements.

CLARK, F., of Southend-on-Sea.

No. 7381; March 27, 1907.

According to this invention, the hydraulic main is so shaped in cross section that the side nearest to the ascension pipes has an inclination towards the side remote from them, through which inclined part the ascension pipes pass to a point above the level of the cover of the main, and which top or cover is completed by superposed chambers corresponding in number to the ascension pipes, and each adapted to contain a bell or dip-pipe telescopically arranged over the upper end of the ascension pipe, and extending into the liquid in the hydraulic main so as to effect the necessary liquid seal—means being provided to enable the position of the bell or dip-pipe to be altered from outside the containing chamber, for determining its position, and for bodily removing it when required.



Clark's Adjustable Dip-Pipes.

The hydraulic main shown is formed with a front side or wall the upper part of which is vertical, then extends inwardly at an angle, and finally further inwardly and downwardly at a greater angle to join the usual semi-cylindrical bottom, wherein tarry matter collects. The opposite side or back wall of the main may be vertical. The ascension pipes B (of which only one is shown) are straight at the upper end; and at a convenient height above the retort-bench they may be constituted of lengths of lighter pipe or extensions coupled to the main portion of the pipes and passed through the inclined part of the front side or wall of the hydraulic main which connects the vertical portion with the part of greatest inclination. A liquid-tight joint is formed between the extension pipes and the hydraulic main, as, for example, by flanged collars C. The upper end of each ascension pipe extension is continued through the cover of the hydraulic main, over which is secured a cylindrical chamber F having a cover removably attached by hinged or pivoted bolts and wing nuts. Inside the chamber, and surrounding the extremity of the ascension pipe extension, is a bell or dip-pipe K (closed at the upper end) suspended from the cover of the chamber by screw-threaded spindles or bolts L, which, after passing through the cover, are provided with nut wheels, adapted to be readily turned by hand, and by means of which the position of the bell or dip-pipe can be varied. The closure of the upper end of the bell or dip-pipe may be effected by a cover N similar to the cover on the outer chamber, and held in position by nuts—the joint being made with an asbestos ring. To limit the descent of the bell or dip-pipe, a flanged ring O may be fixed to the latter and arranged to engage the cover of the hydraulic main—an asbestos ring forming a gas-tight joint with the cover, so that during the cleaning of the ascension pipe gas cannot escape.

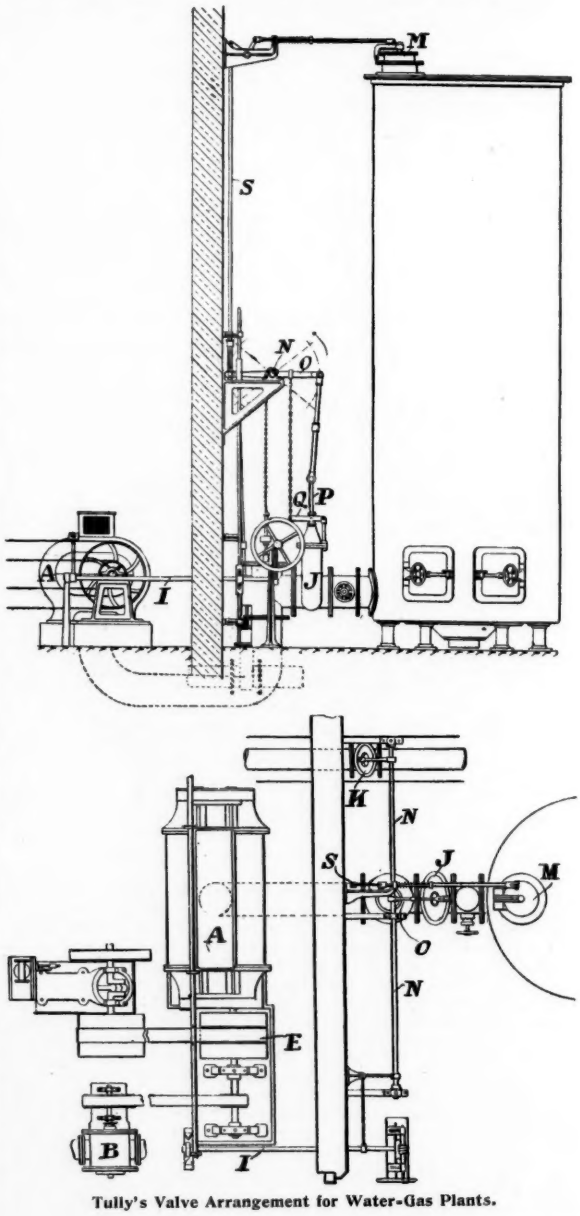
It will be obvious from the foregoing description that the lower end of the bell or dip-pipe K is sealed only with liquid; the tarry matter delivered by the ascension pipes being directed to the bottom of the hydraulic main by the inclined surface through which the ascension pipes pass; that the extent of the seal can be easily varied; and that each of the dip-pipes can be completely removed when desired.

Production of Gas for Heating and Illuminating Purposes.

TULLY, C. B., of Wood Green, N.

No. 8293; April 9, 1907.

This invention has reference to gas plant wherein a generator or cupola is charged with fuel that is raised to incandescence by an air-blast produced by a blower, and the resulting gas allowed to escape past a stack-valve, while heating or illuminating gas is afterwards produced by injecting steam or steam and liquid hydrocarbon into or on to the incandescent fuel—the resulting gas being drawn off,



Tully's Valve Arrangement for Water-Gas Plants.

by means of an exhauster (it may be through purifying apparatus), into a holder or other receptacle. It has special reference to plant wherein the air-blower and the gas-exhauster can be separately operated from driving apparatus under the control of a single operating device, such as a hand wheel or lever, and the blast-main, gas-main, and stack-

pipe are provided with separate controlling valves, so as to ensure their opening and closing in such manner that they shall fulfil their proper functions; that the valves shall become effectually closed at the required times, and not be liable to be held partly open by any dirt entering their casings; that the opening and closing movements of the valves can be timed to suit requirement; and that explosive mixtures of air and gas shall not be present in the blast-main between the blower and blast-valve when the latter is opened to place the former in communication with the generator.

In the arrangement shown, the blower A and exhauster B are separately driven from two co-axially arranged shafts, to the adjacent ends of which are fixed two pulleys with an intermediate loose pulley E. Upon the loose pulley normally runs the driving belt of an engine; and in connection with the belt there is provided a belt shifter, by which the belt can be moved at will from the loose pulley to either of the fast pulleys, so as to drive either the blower A or the exhauster B, or be moved back on to the loose pulley when both the blower and the exhauster are to be put out of action.

The blast, gas, and stack valves J, K, and M are arrranged to be positively opened from a second rock shaft N, arranged above the blast and gas valves and below the stack valve, and is connected, through a lever arm, to a vertically movable rod, which is connected to a lever arm on the rock shaft I. The blast and gas valves J and K are of the sluice-valve type, arranged to move vertically in their casing and to close tightly against their seats by a wedge-like action, as usual. The blast-valve J is connected to an arm O on the rock shaft N through a sliding joint connection, comprising, for example, two rods, one of which, P, is connected to the valve J, and is provided at its upper end with a vertically adjustable nut or stop; while the other is connected at its upper end to the corresponding lever arm, and at its lower end is made of ∩ or equivalent shape, and carries a tappet, arranged to slide on the rod P—the arrangement being such that, when the lever arm O is raised, the tappet on the other rod Q will engage the stop on the rod P and lift the blast-valve, and when the lever arm O is lowered, the tappet will move downward and allow the rod to fall, and enable the attached valve to close against its seat by gravity alone. By adjustment of the stop relatively to the tappet, the time at which the blast-valve will be opened and allowed to close when the rock shaft N is operated can be varied. The gas-valve K is connected in a similar manner, and for a like purpose, to another arm on the shaft N.

The blast-valve J, and also the gas-valve K if desired, may be arranged to be positively forced off its seat to a small extent, as by a lever Q, pivoted at one end to a support on the valve casing and connected at the other end through a chain or a vertical rod, either to a separate arm on the rock shaft N or, as shown, to a point of the lever arm O that is nearer to the shaft N than the point to which the valve-lifting rod is connected. The lever Q is arranged to engage a collar, or equivalent, fixed upon the lower rod P of the sliding joint; the arrangement being such that the lever will lift the valve before the tappet of the corresponding sliding joint comes into action to lift the valve. If a separate lever arm on the shaft N be used for forcing open the valve through the lever Q, it is made shorter than the arm O used for afterward lifting the valve through the sliding joint. In this way, a powerful lever action can be brought to bear upon the blast or gas valve, or each of them, to open it, should it become held fast for any reason.

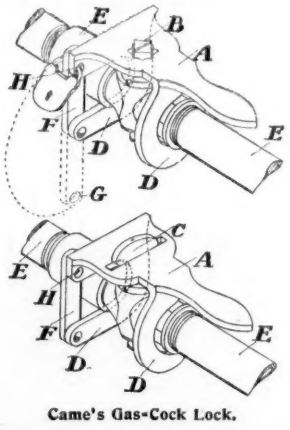
The stack-valve M may be of the same type as the blower and gas valves, and be connected through a sliding joint to a bell-crank lever connected through a horizontal rod and a second bell-crank lever to a vertical rod S that is arranged to be operated, through a pin and slot connection, from a separate lever arm on the rock shaft N. Or, as is preferred, and shown, the stack-valve M may be of the hinged flap type, and be connected by a rod working through a guide and a bell-crank lever to the vertical rod S connected to the operating lever arm on the rock shaft N. The arrangement is such that when the lever arm is moved downward by rotation of the shaft N in one direction, it depresses the rod S and opens the stack-valve M against the action of gravity and of a spring, which will act to close the valve when the shaft is turned in the opposite direction.

Locking Gas Cocks and Valves.

CAME, L. A., of Stoke Newington, N.

No. 10,215; May 2, 1907.

As shown, the locking frame A is fixed to the spindle B of the gas cock or valve, or to the key or handle C operating it. The frame is provided



Came's Gas-Cock Lock.

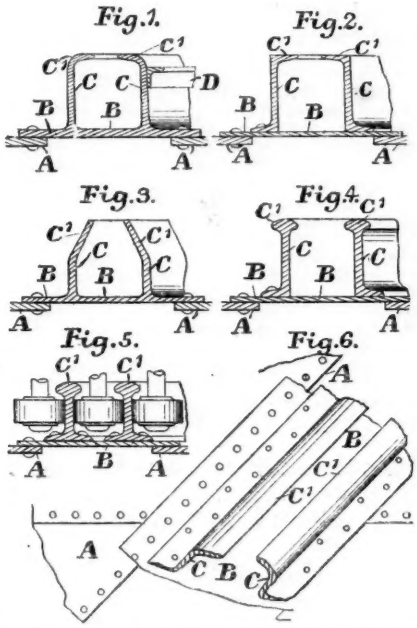
with dependent arms or saddle-pieces D, one on each side of the valve-spindle, and curved to fit the supply pipe E. One (or both if desired) of the dependent arms or saddle-pieces is fitted with a hinged gate F, adapted to bridge the gap of the arm or saddle across the opposite side of the supply pipe—the gate having in its free end an aperture G adapted to register with a corresponding aperture H in the upper part of the arm or saddle. When the valve is closed, the frame thereon may be secured at any time in this position by closing the gate and securing it by passing the bow of a padlock through the apertures in the gate and frame. The spindle of the cock or valve cannot then be turned until the frame is unlocked.

Guide-Rails for Spirally-Guided Holders.

HALLIWELL, F., and R. & J. DEMPSTER, LIMITED, of Manchester.

No. 10,893; May 10, 1907.

These improvements relate to guide-rails for spirally-guided holders, where it is desired to employ a single guide-roller for each spiral guide; and the proposal is to form special guide-rail section or sections for this purpose, in cross section, consisting of a base-plate or equivalent with two members projecting from it primarily forming a trough in which the single roller may travel. These two members have their outer parts turned towards each other, in such a way as to form flanges, or equivalent abutments, which will retain the roller in the trough. For example, the members may be turned over (either in the rolling or subsequently) at their outer edges, or the same result may be obtained by attaching to a base-plate two Z-shaped section rails in opposing positions.



Halliwell and Dempster's Guide-Rails for Spiral Gasholders.

Figs. 1 to 4 are cross sectional views of such gasholder guide-rails of various forms; fig. 5 shows in cross section a guide-rail in conjunction with guide-rollers; while fig. 6 illustrates an application of the guide-rail to a portion of the side of a holder.

A is the gasholder sheeting, and B the base-plate of the rail, which plate, in figs. 2, 4, and 5, consists of the sheeting. C are the members projecting from the base-plate, and primarily forming a trough in which the single roller may travel. C^1 are flanges capable of retaining the roller within the trough. In fig. 1 these flanges are shown rolled in curve form; whereas in fig. 2 they are angular—two rails of Z-shaped section being employed. Fig. 3 shows a modified form of angular flange; and figs. 4 and 5 show a variety of rail having a thickened flange forming a head. Although in most cases it is preferable to adopt the single guide-roller, an additional roller or rollers may be employed if desired. As an example, fig. 5 shows two additional rollers engaging the exterior surfaces of the guide-rails.

Protuberances, such as that indicated at D, may be provided to facilitate the carrying away of the rain or overflow water.

Discharging the Contents of Trays, Sieves, &c., Used in Connection with Gas-Purifiers.

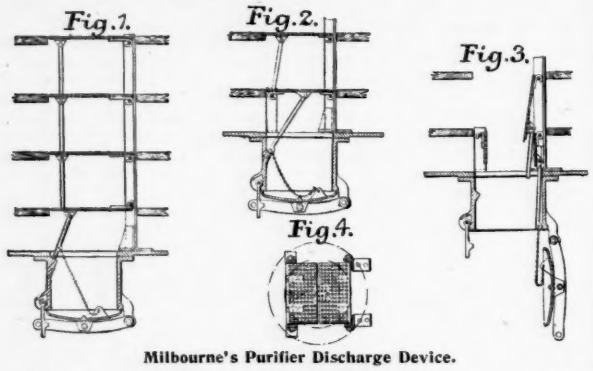
MILBOURNE, R. J., of Muxton, near Newport, Salop.

No. 19,173; Aug. 26, 1907.

This invention relates to devices for discharging the contents of gas-purifiers and for analogous discharging purposes—forming the subject of a patent (No. 1389 of 1907) recently described in this column. The present invention consists of an improvement designed for use where the discharge closures of the sieve are of large size, or where the material they have to support is of greater weight than ordinary, or whenever it is desired to relieve the discharge door or cover of the weight of the closures and the material supported by them. The inventor provides means whereby the weight of the closures and the material they carry has not to be borne by the discharge door or cover, and so he prevents the weight having any tendency to strain the door or cover, and to render its closure less secure.

To accomplish this, instead of supporting the lowest closure by a leg bearing on the discharge door or cover, as in the earlier patent, means

are provided for supporting the lowest closure independently of the cover, preferably by making the leg which supports it shorter, and providing the interior of the mouthpiece with a projection or recess, upon which the lower end of the shorter leg rests when the discharge door is closed and the lowest closure is in position to support the material and the closures above. The leg is connected to the discharge door by a chain, or a system of levers, or connecting rods, or their equivalent, so that, when the discharge door is open, the leg will be removed from its supporting position to allow the closures to open, as described in the earlier patent.



Milbourne's Purifier Discharge Device.

Fig. 1 is a vertical section of one arrangement where the upper perforated closures are provided with legs which rest on the closures beneath, as described in the former specification; but the lowest perforated closure is provided with a short leg centered by a pin to the lug on the lowest closure. The mouthpiece is provided with a projection in a suitable position to support the lower end of the leg when the cover and closures are in the shut position as illustrated. The leg is connected to the discharge door by a chain; and when the cover is opened, the chain causes the leg to leave the projection, and the closures open after the manner already described.

Figs. 2 and 3 are vertical sections showing respectively the shut and open positions of the closures; and fig. 4 is a transverse section of a modification where the lowest closure is divided into two parts, one of which is provided with a leg connected to the cover by a chain capable of resting on a projection in the mouthpiece, as in fig. 1. The other part of the closure is not connected to the discharge door, but is fitted at one side, with hook hinges, mounted on a rod secured to uprights. The opposite side of this part of the closure, when shut as shown, is supported in position by the projections from the other part of the closure. When the cover is opened, the chain pulls the leg from the projection, as in fig. 1; and then the two parts of the closure open, and the upper closures also open as before.

Treatment of Ammonia Liquors.

GROSSMANN, J., of Manchester.

No. 19,988; Sept. 7, 1907.

Crude ammonia liquors, the patentee remarks, contain ammonium cyanide and other volatile cyanogen compounds, which, during the process of distillation in the ammonia stills, are given off as poisonous compounds. For this reason, and also on account of the commercial value of these compounds, attempts have been made at converting the cyanide in ammonia liquors into ferrocyanide and at recovering the latter. But, being based on the assumption that alkaline cyanide, on being treated with an excess of iron compound, will produce insoluble ferrocyanide compounds, the methods hitherto proposed have been found impracticable. If it was desired to produce only soluble ferrocyanide, each batch had to be tested in order to calculate the exact quantity of iron necessary. In that case only part of the cyanogen was converted into ferrocyanide, unless the operation was carried on over an impracticable length of time. If, on the other hand, it was desired to produce only insoluble ferrocyanide, such an excess of iron compound had to be used as would produce a thick mass approaching a magma, and which, in the subsequent operation of distilling, could not be passed through a continuous still, but had to be distilled in special stills supplied with agitators.

The inventor has, however, found that, in the presence of a considerable quantity of ammonium sulphide, excess of iron sulphide (within certain limits), acting on alkaline cyanide, will produce soluble ferrocyanide only; and he has further found that, generally, the composition of crude ammonia liquors as obtained in the dry distillation of coal is such as to render practicable the use of five, seven, or even more times of iron than would be required, according to theory, for the conversion of the cyanide present, without insoluble ferrocyanides being formed.

These facts, which he has thus established, he utilizes in such a manner as to enable him, by using a considerable excess of iron sulphide, to convert within a reasonably short time the cyanide present in crude ammonia liquors into soluble ferrocyanide without entailing the necessity of testing each batch for the quantity of volatile cyanide present. For this purpose, he proceeds as follows.

In the first place he ascertains, by analyzing samples which have been taken over a lengthened period, what is the average quantity of cyanide present in the crude liquors which require treatment. He then treats a fair average sample of the latter in the laboratory with two, three, five, and seven times the quantity of iron sulphide which is theoretically necessary for the conversion of the cyanide into ferro cyanide, and notes the highest quantity of iron sulphide which he may use in order to effect this, and which, on subsequent settling, will not interfere with the rapidity of the settling, or yield too large a bulk of insoluble settlings.

Supposing, for instance, it was found that the average sample of a certain crude ammonia liquor contained cyanide equivalent to one hundredth pound of prussic acid (CnH) per gallon; and supposing it were found that one thirty-seventh pound of iron sulphide (FeS) per gallon without producing either insoluble ferrocyanides or an impracticable amount of settlings, and which is about five times the quantity of iron required by theory, this particular liquor would, on a large scale, be treated as follows.

A certain quantity—say, for instance, 10,000 gallons of the crude liquor—is placed into a tank provided with suitable agitating arrangements; and after adding 272 lbs. of iron sulphide, the mass is agitated until all the cyanide has been converted into ferrocyanide. The mixture is removed into a settling tank; and, after settling, the clear liquor is separated from the sediment. The sediment is returned to the mixing-tank, and 54½ lbs. of iron sulphide—*i.e.*, one-fifth of the above quantity—is added to it. Another batch of 10,000 gallons of the crude ammonia liquor is run into the mixing-tank, and the mixture agitated; and so on in such a manner as to add 54½ lbs. of fresh iron sulphide to each batch of 10,000 gallons and to keep the total quantity or iron sulphide in each batch on an average at 272 lbs.

It is evident the details of this operation may be considerably altered in such manner as to enable one to work continuously, and to supply the agitators with the settlings of previous operations from a store tank, in such quantities as will keep constant the total iron sulphide at the quantity found most suitable by the laboratory tests.

Any alterations which may in course of time occur may be ascertained by testing the liquors from time to time—say, every few days—and the supply of iron sulphide corrected accordingly.

The sulphide of iron used may be obtained by mixing iron or its compounds with crude ammonia liquor particularly rich in sulphides. If the crude liquor contains sufficiently large quantities of sulphide in proportion to the cyanogen compounds present, the iron sulphide need not be produced by separate operations, but may be produced in the mixing-tank itself. In either case any suitable iron compounds which contain iron sulphide, or which will yield sulphide on being treated with ammonium sulphide, can be used—such as iron sulphides, iron scrap or filings, hydrated iron sulphides, ferrates, iron carbonates, ferrous ferrocyanide, or double compounds of the same, and the like. Any of these may be used by themselves or mixed with others of the substance mentioned.

If in the process of converting cyanide into ferrocyanide it is desirable to shorten the time of agitation and yet remove all the cyanide, lumps of sulphur may be added at a convenient time towards the end of the agitation. These lumps are placed in the agitator in such a manner that they can be separated from the mixture before it runs to the settling tanks.

The crude ammonia liquors are preferably used fresh; and they may be taken from any convenient place in the condensing system. Before being subjected to the process described, they are preferably freed as much as possible from tarry and other matter in suspension. If the residues of iron sulphide produced in the settling tanks in course of time become contaminated with inert matters, they may be worked up, and iron, ammonia, and any ferrocyanide present recovered by successive treatment with acid and alkali, or in any other way.

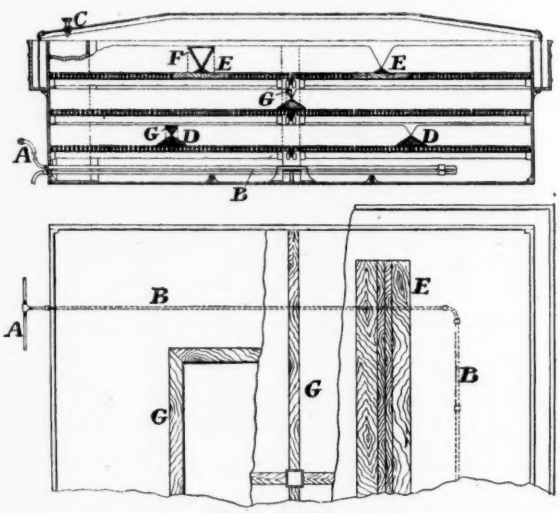
After having converted all the cyanides into ferrocyanides as described, and after settling or filtration, the clear ammonia liquor is passed through the ammonia stills in the usual manner. According to its nature, the effluent from the stills, before, during, or after settling, may be treated for the recovery of ferrocyanide in solution. In order to effect this, such a quantity of a suitable iron compound—such as ferrous or ferric chloride—is added to the effluent (either such as it is, or after being neutralized, or acidified) as will convert the soluble ferrocyanide into an insoluble ferrocyanogen compound or double compound. Suitable precipitating compounds may be soluble salts, such as ferrous or ferric chloride or sulphate, or any of the substances mentioned in the first operation which form insoluble ferrocyanogen compounds or double compounds from a soluble ferrocyanide on agitation.

Purifier.

VASS, D., of Airdrie, N.B.

No. 26,032; Nov. 25, 1907.

This invention relates to the purification of coal gas, water gas, waste gas from sulphate of ammonia stills, &c., and any other form of



Vass's Purifier.

gas, or mixture of gases, where solid material (say) hydrated oxide of iron, mixed with sawdust when used for the removal of a gas by

chemical action, undergoes a process of expansion during, or resulting from, such chemical action.

The invention has for its primary object "to allow for free lateral expansion of the material while undergoing chemical action, and so minimize the resistance of the material to the flow of gas." This freedom for lateral expansion is obtained by forming furrows in the mass of material; and the grids under the furrow are so constructed as to prevent the passage of the gas through the thinner part of the layer of material at the furrow. A subordinate feature of the invention is the arrangement of a steam-coil for imparting during adverse atmospheric conditions a moderate amount of radiant heat to the gases which act on the working material, and which "should not have a temperature exceeding 70° Fahr."

A is a pipe conveying steam to the coil B fitted in the space between the gas inlet and the material. The forward flow of the gas assists in carrying forward the heat radiated from the coil. C is a thermometer placed (preferably over the gas outlet) so that temperature may be adjusted. D and E are two forms of baffle-boards to prevent the flow of gas through the thinner part of the material; and removable cradles are placed over the centre of these baffle-boards during the time that layer of material is being laid down, and the removal of which, after the levelling of the mass, forms the required furrows as indicated in the vertical section.

APPLICATIONS FOR LETTERS PATENT.

4654.—Davis, H. N., "Grill-pans for gas-stoves." March 2.
4655-6.—Davis, H. N., "Gas-cooking stoves." March 2.
4659.—Nehmer, H., "Incandescent burners." March 2.
4661.—Prosser, H. R., "Incandescent gas-lamps." March 2.
4722 —Bührer, J., "Gas-fired furnaces." March 2.
4738.—Chambers, E., "Gas-ovens." March 2.
4767.—Stanley, R. J., "Gas motor or turbine." March 3.
4885.—Maddick, J. C. A., "Electric gas lighter." March 4.
4927.—Joy, B. C., "Lifting liquids by direct explosive force of combustibles." March 4.
4978.—Beckett, E. H., "Jet-condensers." March 5.
4980.—Dowsen, C., "Ball-and-socket joint." March 5.
4986.—Grocott, R. T., "Inverted burners." March 5.
5030.—Denayrouze, L., "Illumination and heating by vapour burners." March 5.
5031.—Still, E. H., "Incandescent gas-lamps." March 5.
5059.—Wiltshire, O., "High-pressure tap." March 6.
5067.—Fallot, L., "Utilization of acetylene and oxygen." March 6.
5096.—Malone, C. J. l'E., "Single-cycle gas-engine." March 6.
5162.—Parsons, I. H., Avery, W. L., and Ball, A. E. J. "Sealing devices for meters." March 7.
5171.—Parnham, A. E., "Prepayment meters." March 7.
5181.—Bruce, A., Air-gas plants." March 7.
5185.—Booth, G., "Automatic prevention of the escape of gas." March 7.
5187.—Schmatolla, E., "Gas-fired kilns." March 7.
5188.—Schmatolla, E., "Gas-producers." March 7.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The only progress made with Bills last week was the third reading and passing of the Huddersfield Water Bill; and the withdrawal of the opposition to the Audenshaw and Saddleworth Urban District Councils Bill, the Bognor Gaslight and Coke Company Bill, and the Skegness Urban District Council Bill.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bills read a second time and committed: Blaydon and Ryton Water (Transfer) Bill, Dartford Gas Bill, and the Liverpool Corporation Bill.

Bills reported: Conway and Colwyn Bay Joint Water Board Bill, Derby Gas Bill, Gosport Gas Bill, Rochdale Corporation Bill, Stockport Corporation Bill, Swinton and Mexborough Gas Bill, and the West Bridgford Urban District Council Water Bill [preamble not proved].

Bill withdrawn: Greystones Gas Bill.

To the notices already given in opposition to the Coal Mines (Eight Hours) Bill, Lord Robert Cecil has added one to the effect that when the second reading stage is reached he will move—"That this House declines to proceed with a measure that will raise the price of coal without conferring any real benefit upon the workmen engaged in the mining industry."

AUCTION CLAUSES FOR GAS BILLS.

New Model Clauses.

The following are the new model auction clauses which have been drafted by the Lord Chairman and the Chairman of Ways and Means for insertion in future Gas Bills, to which reference is made in our "Notes from Westminster."

1.—All shares or stock to be created by the company under the powers of this Act shall be issued in accordance with the provisions of this section.

2.—All shares or stock so to be issued shall be offered for sale by public auction or tender, in such manner, at such times, and subject to such conditions of sale as the company shall from time to time determine. Provided as follows:—

(*a*) Notice of the intended sale shall be given in writing to the clerk to each urban or rural district council having jurisdiction over any part of the limits of supply and to the Secretary of the London Stock Exchange at least 28 days before the day of auction or the last day for the reception of tenders, as the case may be, and shall also be duly advertised once in each of two consecutive weeks in one or more local newspapers circulating within the limits of supply.

(*b*) A reserve price shall be fixed, and notice thereof shall be sent by the company in a sealed letter to be received by the Board of Trade not less than 24 hours before, but not to be opened till after, the day of auction or last day for the receipt of tenders, as the case may be.

(*c*) No lot offered for sale shall comprise shares or stock of greater nominal value than £100.

(*d*) In the case of a sale by tender, no preference shall be given to one of two or more persons tendering the same sum. In the case of a sale by auction, a bid shall not be recognized unless it is in advance of the last preceding bid.

(*e*) It shall be one of the conditions of sale that the total sum payable by the purchaser shall be paid to the company within three months after the date of the auction or of the acceptance of the tender, as the case may be.

3.—Any shares or stock which have been so offered for sale and are not sold may be offered at the reserve price to the holders of ordinary shares or stock of the company in manner provided by the Companies Clauses Act, 1863, and to the employees of the company and to the consumers of gas supplied by the company, in such proportions as the company may think fit, or to one or more of these classes of persons only.

4.—Any shares or stock which have been offered in accordance with sub-section 3, and are not sold, shall be again offered for sale by public auction or by tender, in accordance with the provisions of this section; and any such shares or stock then remaining unsold may be otherwise disposed of, at such price and in such manner as the directors may determine, for the purpose of realizing the best price obtainable.

5.—As soon as possible after the conclusion of the sale or sales, the company shall send a report thereof to the Board of Trade, stating the total amount of the shares or stock sold, the total amount obtained as premium (if any), and the highest and lowest prices obtained for the shares or stock, as the case may be.

UNOPPOSED BILLS.

The Unopposed Committee of the House of Commons, presided over by Mr. A. Emmott (Chairman of Ways and Means), had under consideration last Thursday the following Bills.

Derby Gas Bill.

This Bill, which was presented by Mr. Cripps, sought powers to acquire other gas-works.

Mr. *W. Woolley*, the Solicitor to the promoting Company, proved the allegations in the preamble, and stated that the Bill merely proposed to transfer to the Company the undertaking of the Belper Gas Company, and to enable the Company to acquire a privately-owned gas-works in an adjoining area. The acquisition of the Limited Company was to take place by an exchange of shares in the Company for consolidated stock of the Derby Gas Company. The amount of stock fixed in the Bill was £12,000, and in the agreement £14,630. He explained the difference in this way: The balance of £2600 would, at the market price, realize £3198; and out of this the Liquidators had to pay £2000 on debenture stock, £700 compensation to Directors, and £500 compensation to the Secretary. The Derby Gas Company were taking the present step at the request of the Belper Urban District Council; and the effect of it would be to reduce the price of gas in Belper from 3s. 4d. to 2s. 10d. per 1000 cubic feet.

The Bill was passed, and ordered to be reported for third reading.

Southwell Gas Bill.

Mr. *Oldham*, Parliamentary Agent, in presenting this Bill, stated that it was promoted for the purpose of acquiring the undertaking of the Southwell Gas Company and the Farnsfield Gas Company. The Company was incorporated in 1906 with a capital of £16,500. The cost of the two undertakings was £11,250, and an additional sum of £8000 had been spent. It was proposed to re-incorporate the Company, and raise additional capital amounting to £20,000. The standard price for both districts had been fixed at 3s. 10d. per 1000 cubic feet, as compared with 3s. 10d. now charged at Southwell and 4s. 2d. in Farnsfield. During the twelve months the Company had been in operation, a dividend of 2½ per cent. had been paid.

Mr. *Henry Woodall* (Messrs. Corbet Woodall and Son), in support of the Bill, said he had no figures to show the growth of the undertaking from sales of gas; but he had been from one end of the district to the other, and there was every prospect of considerable development from colliery workings and building operations. The area was a very wide one, and the expenditure of the Company would naturally be heavy. A main had been laid the whole way from Southwell to Farnsfield. It was proposed to divide the original capital into 8250 10 per cent. shares and 8250 5 per cent. preference shares.

Mr. *J. N. Derbyshire*, the Chairman of the Company, proved the preamble of the Bill.

With regard to clause 41, dealing with the renewal fund,

Mr. Emmott said they were not prepared to add to the precedents in this matter by allowing the clause. It would be struck out; but he wished to say that the whole question was going to be considered. He thought they must deal with it in the comparatively near future.

After conversation between the Committee and Mr. Oldham, it was decided not to strike out the clause, but to adjourn the matter.

The other portions of the Bill were gone through; and amendments having been made to meet the report of the Local Government Board, the further proceedings were adjourned—no date being fixed.

GOSPORT GAS BILL.

House of Commons Committee.—Monday, March 9.

(*Before Mr.* WHITBREAD, *Chairman, Major* RATCLIFF, *and Mr.* PEARSON.)

This Bill (*ante* p. 634) came before the Committee to-day for the adjustment of clauses.

Mr. HONORATUS LLOYD, K.C., and Mr. DILL appeared for the promoters; the petitioners (the Gosport and Alverstoke Urban District Council) being represented by the Hon. J. D. FITZGERALD, K.C., and Mr. CLEASE.

Mr. FITZGERALD said the parties were agreed with regard to the clauses, and there was no contentious matter. As to the renewal-fund clause, it must be quite understood that, in not raising the point before the Committee, he was reserving the right to object to it hereafter. Independently of any question of principle, he should decidedly have objected to the figure of 10 per cent. on the nominal capital.

The CHAIRMAN remarked that it seemed unnecessary to argue the matter twice.

Mr. HONORATUS LLOYD said there would be no mistake about that; but there was one other point.

Mr. FITZGERALD explained that, under the general principle of gas legislation, after a company had paid their dividend and provided for their reserve and insurance funds, they were not to be allowed to keep in their hands an indefinite amount of money by carrying it forward from year to year. The effect, if this were allowed, would be to postpone indefinitely any reduction in the price of gas. If the Company were allowed to put a certain sum to reserve fund and a certain sum to insurance fund, and there was a good amount over, it ought to be applied in reducting the price of gas. As the Bill stood, then, there would be no limit of the amount to be kept in their hands; and they might carry forward £5000 or £50,000—not giving the consumer the benefit. This effect had been pointed out some years ago; and since then it had been usual to insert a provision that the amount carried forward should be limited. The limitation he proposed was: "Provided that the sum so carried forward shall not in any case exceed the amount required to pay a half-year's dividend at the authorized rate on the paid-up capital of the Company for the time being." This was taken from the Mitcham and Wimbledon Gas Act of last year. It had also been done in other cases, including Croydon. He did not think it was understood till quite recently that a gas company had the power to carry forward an indefinite sum. He would meet his learned friend by saying that the amount carried forward should not be a half-year's dividend, but a full year's dividend.

Mr. HONORATUS LLOYD agreed that such a clause as was proposed had been inserted in some Bills, but had been left out in a great many others. What was the object of limiting the carry-over when they had established a sliding-scale, and in so doing had given the consumer a very much larger interest than the company? It was a matter of ordinary common business; and when they had established a sliding-scale and given the consumers and shareholders an interest in the matter, the result was that the companies did not carry forward an excessive amount.

Mr. FITZGERALD remarked that, having got a reserve fund and an insurance fund, his learned friend was asking for a third fund in the shape of an unlimited carry-over. It was not reasonable that the Company should be able, after paying the standard rate of dividend, to carry forward an unlimited amount.

The CHAIRMAN said that the carry-forward would be limited to one year's dividend.

The clauses were then finally adjusted.

SWINTON AND MEXBOROUGH GAS BILL.

House of Commons Committee.—Tuesday, March 10.

(*Before Mr.* WHITBREAD, *Chairman, Major* RATCLIFF, *Mr.* PEARSON, *and Mr.* WALTER REA.)

This Bill is promoted by the Swinton and Mexborough Gas Company for the purpose, among other things, of incorporating and conferring powers upon the Company.

Mr. WEDDERBURN, K.C., Mr. HONORATUS LLOYD, K.C., Mr. J. W. GREIG, and Mr. F. N. KEEN appeared for the promoters; and the Hon. J. D. FITZGERALD, K.C., and Mr. CLEASE represented the petitioners (the Mexborough Urban District Council).

Mr. WEDDERBURN, in opening the case on behalf of the promoters, said this was a non-statutory Company; but they had a Provisional Order which had been confirmed by Act of Parliament. They were now applying to be incorporated under an Act of their own, with additional capital. The Company started in 1856 with a capital of £3500, in 700 £5 shares, the maximum dividend on which was 10 per cent. Later they had powers to raise further capital up to £9500; and they also had borrowing powers. The three Local Authorities concerned were the Swinton Urban District Council, the Mexborough Urban District Council, and, as representing Adwick, the Doncaster Rural District Council. The price they were to charge was to be 5s. per 1000 cubic feet within a mile-and-a-quarter radius from the works, and 5s. 10d. beyond that. Their capital and borrowing powers became exhausted more than a year ago. The business prospered till 1902, when the Urban District Council started an electrical undertaking. This had been run at a loss, not only to themselves, but to the gas undertaking. The Company now required more capital in order to extend their business and compete with the Council's undertaking by prepayment meters. Another reason for the loss which the Company had sustained was the leakage of gas, which had been very heavy indeed. This was a colliery district, and the upkeep of the mains was exceedingly difficult and costly. Within the last twenty years, they had had to spend £7450 in this way; but in spite of this the leakage was at one time nearly half the amount of gas produced. Now it was just over 30 per cent. The dividend paid from 1896 to 1906 on the 7 per cent. shares was 7 per cent.; and on the old shares they paid 10 per cent. Latterly, however, they had not been able to pay the full maximum dividend. They had to extend to Adwick, to the north of their district, where new houses had been planned. The Company were not asking for an extension of area, but for additional capital. Originally in the Bill they asked for £40,000; but this had been reduced to £30,000, which amount had been agreed with the Swinton and Doncaster Councils, who were not petitioning. The price of gas proposed was 5s. per 1000 cubic feet; but by agreement this was lowered to 4s, and then Mr. Stevenson advised them that the standard price should be 3s. 6d. In the petition, strong objection was raised to the amount of capital proposed, and also to the dividend of 6 per cent. on the preference capital. With regard to the renewal fund, the object was to enable them to equalize their maintenance expenses. It was a matter which was being discussed by the Lord Chairman and the Counsel to the Speaker, and it arose in the case of the Gosport Gas Bill.

The CHAIRMAN: I think the Committee will take the same course with regard to this Bill.

Mr. WEDDERBURN said they were prepared to take it in exactly the same way. So the clause would stand as at present; but any clause which was agreed between the Houses would be inserted in the Bill in place of the existing one. With regard to the petition dealing with the question of purchase, it would be hard that the Mexborough people should seek to buy them out at a time when they were pretty hard-hit by competition. So far as they were aware, too, the matter had not received the assent of the ratepayers.

Mr. *Henry Woodall* (Messrs. Corbet Woodall and Son) was the first witness called. He said that in 1884 the average sum received from each consumer was £4 3s. 8d. per annum. This amount increased till 1897, when it was £5 14s. Since then it had gradually gone down until 1906, when the receipts per consumer were only £3 4s. 6d. The diminution in income was largely attributable to the establishment of an electric undertaking by the Mexborough Urban District Council; and the Council had not used gas for public lighting since 1902. The leakage in the mains amounted in 1901 to 24,200,000 cubic feet; but this had been reduced in 1907 by 8,199,000 feet, and there was a prospect of further reduction. There were about 30 miles of main in the Company's area; and the consumption per mile of main was only 856,796 cubic feet, which was very low. There was room for the development of business on the prepayment system. He estimated the increased consumption would be 12,000 cubic feet per consumer per annum; and the new consumers were estimated at 3000. The Bill sought to raise £30,000 by shares, and one-third of the total share capital by loan (less £6000 already raised); making a total of £40,500. After deductions, the amount of new capital available for extensions would be £36,738. In 1901, the sale of gas was 41,123,000 cubic feet; and in 1907 it was 31,367,300 feet. In regard to the cost of extentions, he based it on the assumption that they would obtain 3000 consumers, who would use 12,000 cubic feet of gas per annum. This, with the present amount sold, would give a total required of 67,367,000 cubic feet. He had taken 15 per cent. leakage (which he thought they ought to bring the amount down to), which was 10,105,000 cubic feet; giving a total estimated output of 77,472,000 feet. The maximum day's output was 387,362 feet. The benches needed raising and improving, which could be done at an estimated cost of £1500; and the condensing plant would require an expenditure of £150. The exhauster ought to be duplicated. Among other repairs needed were two new purifiers, at a cost of (say) £600; a gasholder, of 150,000 cubic feet capacity, £3000; a sulphate plant and house, £550; workshops, stores, &c., £500; steam crane for handling coal, £150; works mains and connections, £250; additional mains in the district, £3648; prepayment installations, 3000 at £4 each, £12,000; the cost of the Act, £1500—making a total of £24,673. This, deducted from the capital asked for (£36,738), left £12,005 for future extension. The standard price of 3s. 6d. did not leave any margin. The chief reason for this was that the leakage was very high—much higher than it ought to be. If this was reduced, the Company could sell gas at 3s. 6d. per 1000 feet and still pay their maximum dividend; but at the present time they were not earning enough to do so. There had been no complaints as to the quality or quantity of gas. The present would not be a fair time to insist upon a purchase clause under the existing circumstances of the Company. The works could certainly be improved by judicious expenditure. In this district it was possible to get a high candle power. He thought the capital asked for would last for 14 or 15 years.

Mr. *F. L. Harrop*, the Clerk to the Urban District Council and Solicitor to the Company, gave evidence with reference to correspondence between the bodies on the subject.

Mr. *Joseph Bower*, a member of the Swinton Urban District Council, having given evidence,

Mr. *E. H. Stevenson* was called. He stated that the management during recent years had effected an improvement in the working of the Company. It was impossible to supply gas cheaply owing to the large quantity which must necessarily be lost, and because of the high price entailed upon the Company in repairs and maintenance. Parliament had never granted a purchase clause in the case of a statutory gas company with the exception of Pontefract. In his opinion, it was not fair that a company whose property was depreciated by competition should be compelled to sell their undertaking to their competitor. The Company in a certain sense had outrun the constable; but there was no limit whatever to their borrowing powers. If they had chosen to alter their Articles of Association, or whatever it was, they could have borrowed to any amount. But the Company kept out of Parliament ten or eleven years longer than they ought to have done. At present, they were losing 10 million cubic feet of gas per annum which ought not to be lost. The only thing that could be complained of with regard to the Company was that they were not making as much gas per ton of coal as they ought to do, and were not selling as much as they might.

Mr. *John Wortley*, chartered accountant, dealt with the accounts o the Company. He said it was perfectly right to charge anything one could to revenue.

Wednesday, March 11.

On the resumption of the proceedings this morning,

Mr. *W. B. Keen*, chartered accountant, in the course of his evidence, said that for eight years the Company had not paid their maximum dividend. The fall in the business had been due to electrical competition in Mexborough; and the accounts showed that the electric light undertaking was a bad financial failure. The capital of the Company was fully expended prior to the year 1894. He did not agree that capital should be expended and charged against revenue, and capital expenditure paid out of the reserve fund was certainly extraordinary expenditure.

Mr. *C. H. Holland*, the Assistant Manager and Secretary of the Company, said the loss suffered in 1891 was due to the high price of coal. The Company lost a good deal of consumption owing to competition; and they were receiving a considerable amount from the Council for public lighting. In 1900, the sum received was £333 13s. The price charged for gas had varied between 3s. 6d. and 3s. 4d. per 1000 cubic feet.

This concluded the case for the promoters.

Mr. *William Cash* was the first witness called on behalf of the petitioners. He contended that the accounts were not in proper form. The gas made per ton was low, and the gas sold per ton was the worst he had ever seen during the whole of his experience. The business was declining; and the Company had not been managed in the best interests of those concerned. He was sorry to see a concern with results such as those the Company had to show. As to the proposed increase of capital, assuming 14 years, it would mean an increase on the ordinary basis of 5 per cent. compound. There was no doubt that during recent years the Company had jogged along without very much energy. But now they had a new Manager, who had introduced new life; and already the methods of the Company had been improved. Owing to the competition of the electrical undertaking in Mexborough, the Company were doing better because they were driven to do so. The depression of the property was due entirely to their own fault; and only recently the shareholders had received the maximum dividends. He had been through the accounts, and did not find any improperly applied or misappropriated moneys.

Mr. *H. E. Jones* complained that he was definitely refused admission to the Company's works. He had looked into the working of the Company, and, with one slight exception, had never seen such bad working. They had shown no consideration for the consumer. As to the price charged, the Company could have made gas and sold it at least 6d. per 1000 cubic feet less and paid the same dividend.

Mr. *Charles Hunt* expressed himself in agreement with the evidence of Mr. Cash and Mr. Jones as to the working of the Company. The mains were in a deplorable condition. By the aid of the new burner proposed in the Bill, they would be able to supply gas better than would otherwise have been the case. He did not object very much to the amount of capital asked for; but they were only supplying 28 per cent. of the population. The price should be from 3s. to 3s. 3d. per 1000 cubic feet. He was bearing in mind the fact that this was one of the best coalfields in the country. The Company had kept out of Parliament for many years after exceeding their capital; whereas they should have come to Parliament before their capital was all spent. He did not know a case where purchase had been more absolutely justified than in the present instance. The three district authorities, or two of them, should buy the undertaking. He did not realize that whereas Mexborough would desire to see its electric undertaking progress, Swinton would desire to see in Mexborough the gas concern doing well.

After further local evidence had been given on the general question,

Mr. FITZGERALD addressed the Committee on behalf of the petitioners. If the Bill were passed, he would ask that a purchase clause be inserted, and that the standard price to be charged for gas should be less than 3s. 6d.

Thursday, March 12.

When the proceedings were resumed this morning,

Mr. WEDDERBURN, in replying on behalf of the promoters, referred to a letter which the Mexborough Authority had written to the Swinton Council dealing with the purchase of the gas undertaking. It had been stated in the evidence that this letter was not produced at the meeting of the Swinton Council, and that the members of the Council did not fully comprehend its contents. His contention was that the letter was produced at that meeting.

The CHAIRMAN remarked that the only point with which the Committee were now concerned was whether the members of the Swinton Council fully understood the position.

Mr. WEDDERBURN went on to say that, with regard to capital, there was a difference of £5000; but there was not much between the parties on the question of standard price. He suggested that the price should be 3s. 6d. This was not a case in which, in fairness to the shareholders, the Committee could grant a purchase clause; and there was no precedent for granting such a clause where the purchasing authority were actively competing with the company in the matter of electric light. There was not a single instance in which a consumer had complained of the gas supplied by the Company. Quite apart from the question of competition, in all the cases where a purchase clause had been inserted, there had been proof of complaints by the public before the deposit of the Bill. It was not pretended that the Company had not supplied a good article at a reasonable rate; and, moreover, in not one of the three districts had the ratepayers been consulted as to the purchase. By the case as stated by the petitioners, the Committee were asked to advise the ratepayers that, in the judgment of the Committee, this was an instance in which purchase should be allowed. It was said that the reserve fund was £1000 in excess of what it ought to be. As to this he would say that nothing was being piled up in the interests of the shareholders to the detriment of the consumers. With regard to the question of leakage, whereas this originally was 40 per cent., it had been reduced by one-third. No charge had been successfully made against the Company; and he asked that the purchase clause suggested by the petitioners should be declined.

After a private consultation,

The CHAIRMAN announced that the Committee had carefully considered the arguments and the evidence put before them. They did not think it necessary to arrive at any conclusion as to whether the important letter from one local authority to another was or was not actually read at the meeting held. They found it sufficient for their purposes to come to the conclusion that at the meeting the members of the Swinton Local Authority did not, as a matter of fact, apprehend in the full degree in which they ought to have apprehended the position in which the case then lay, and they did not leave the meeting with full knowledge of the importance of the matters laid before them by the Mexborough Authority of the shortness of time and other circumstances which they ought to have had clearly before them, and upon which they should have come to a decision. The condition of the Company, both with regard to management in the past and the state of their plant and mains, was, in the opinion of the Committee, justification for the Committee to require the insertion of a purchase clause in the Bill. But the Committee made it a condition that the purchase should be of a nature requiring both the Local Authorities of Swinton and Mexborough to combine, and not one without the other. Counsel would discuss the exact wording of the clause; and therefore it was not necessary for them to give a decision on the point at that moment. Subject to this, and in the event of the purchase not taking place, the Company would go on with a standard price fixed at 3s. 6d., and with the capital limited to £25,000, *plus* the one-third borrowing powers.

Mr. CLEASE: It is a clause that the two authorities, in combination, may next year bring up a Bill for purchase, and nothing in this measure is to prejudice the position. I take it that, inasmuch as you authorize purchase, if we bring up a Bill, the Company will only be allowed to oppose the purchase clauses?

The CHAIRMAN: Yes.

Friday, March 13.

When the Committee resumed their sitting this morning, considerable discussion took place on the clause arranged by Counsel in accordance with the decision of the Committee.

Mr. FITZGERALD said that, with regard to the word "reasonable," he did not mind its being struck out if the word "taxed" were inserted. He objected to having the costs of obtaining the Act, if they were unreasonable or improper, being thrown upon the District Councils. With regard to the compensation of the officials of the Company, he said his friend objected to the words "twelve years," and suggested "five years." If the Committee accepted this suggestion, it would mean that any official who had been five years in the service of the Company might refuse to accept employment in the same capacity by the Council, and be entitled to full compensation. The provi o ought not to be there at all because it was inserted in the special cases of Airdrie and Coatbridge. He objected to the substitution of five years for twelve years. In the case of Farnham, where a similar clause was inserted, the number of years was fourteen.

Mr. WEDDERBURN, addressing the Chairman with regard to the words "reasonable costs," said in all the precedents he had the words used were "actual costs." In the Hitchin Bill, the words were "the actual costs, charges, and expenses;" and this was the suggestion he made to the Committee in the present case. If they were to produce their vouchers, they ought to get the costs back.

Mr. FITZGERALD intimated that he was willing to put in, in both cases, the words "taxed costs."

Mr. WEDDERBURN remarked that the five years suggested was for the protection of the Secretary of the Company.

Mr. FITZGERALD pointed out that the whole question of the compensation of officials was gone into in the Metropolitan Water Bill; and the provision was that the servants and the officials should be taken over by the Board, and they were to hold office on the same terms as before.

The CHAIRMAN said if the word "reasonable" were struck out, the word "taxed" should go in; and eventually he decided that the word "twelve" must stand.

Mr. FITZGERALD said, with regard to the raising of capital by the Company, they were going to purchase the undertaking, and the expenditure of further capital ought to be in the hands of the Council. Mr. Wedderburn wanted to put in that the Company should not raise any ordinary share capital, but that they might raise by borrowing or preference shares what was necessary for the carrying on of the undertaking until the purchase was effected, provided the amount so raised should not exceed £5000, except with the consent of the Council.

Mr. *Stevenson* went into the witness box and stated why they desired the alterations. He said they might raise up to £5000 by borrowing or by preference, at a fixed rate. It was essential that the Company should have money to carry on their business during the coming year. They had overspent their capital by £3762, of which nearly £3000 was a loan from the bank. In numbers of cases of purchase it had been customary to allow the Company to expend certain amounts—borrowing, according to the magnitude of the company, during the year in which the purchase might or might not take place. The money now asked for would not improve the position of the Company. They should not claim in consequence of it; and the alteration was not in any way to affect the decision of the Committee. The object was to enable them at once to go on with their business, so that in the event of the Councils not purchasing, they might have money to carry on the works. The clause as put forward had been allowed in the cases of Mitcham, East Hull, and Merthyr.

In reply to Mr. CLEASE, witness said that the capital asked for was to allow them to extend the mains so as to be able to pay off the bank. He did not agree that in arbitration the claim made would be increased; it would not add in the slightest to the value of the undertaking.

Mr. CLEASE: They have failed to do their duty up till now. Do you suggest that Parliament should allow them, at the last moment, to raise capital in order that they might do what they had not considered it worth while doing all these years? Do you think that would be carrying out the decision of the Committee?

Witness: I do not think it would have the effect of increasing the claim in arbitration.

Witness went on to remark that the object was, in the event of the Councils not buying the undertaking, the Company would have an idle

year put upon them. The clause had been inserted in Gas Bills over and over again.

Mr. CLEASE said that unless the clause remained—and there was every precedent for it—he believed they would absolutely defeat the object of the Bill.

The CHAIRMAN, after further discussion, announced that the clause must stand.

The only other point was the alteration of the preference dividend to 5 per cent.; and on behalf of the Company, this was agreed to by Mr. Stevenson.

The following is the agreed clause to be inserted in the Bill:—

(1) If the Urban District Councils of Swinton and Mexborough jointly (which Councils in this section are called the "Councils") shall introduce a Bill in the next session of Parliament and *bonâ fide* promote the same for an Act to provide for the constitution of a Gas Board to empower the Board to be constituted to purchase the undertaking of the Company, the Company shall not oppose such Bill, except in so far as may be necessary in order to secure the insertion therein of clauses to protect their interests with respect to such purchase, and for that purpose the Company shall be at liberty to petition either or both Houses of Parliament, and to appear on such petition by counsel, agents, and witnesses, if they think fit, and if the Councils obtain an Act authorizing such purchase by the Board, the Board shall give notice of their intention to purchase within six months after the passing of such Act, and thereupon the Company shall sell and transfer, and the Board shall purchase, the undertaking of the Company subject to all their then existing debentures, mortgages, obligations, and liabilities.

(2) Any such sale and purchase shall be for such price or consideration, and on and subject to such terms and conditions, as may be agreed upon between the Company and the Board, or, as failing such agreement, shall be determined by arbitration in accordance with the provisions of the Lands Clauses Act with respect to the purchase and taking of lands otherwise than by agreement; and in the construction of the said provisions the expression "the promoters of the undertaking" shall mean the Board, and the expression "lands" shall mean the undertaking of the Company. Provided that, in addition to the sum to be paid by the Board to the Company under the foregoing provisions of this section, the Board shall pay to the Company (*a*) the costs of obtaining this Act as taxed between solicitor and client, (*b*) the reasonable costs of winding-up the Company, (*c*) such compensation to the officials of the Company on the basis of the salaries paid to them on the 1st day of January, 1908, as, failing agreement, may be fixed by arbitration. But in fixing such compensation the arbitrator shall take into account any reasonable offer by the Board to continue any officials in their employment. Provided that where an official has been not less than twelve months in the service of the Company the refusal to accept employment under the Board shall not be a bar to compensation.

(3) The Company shall not, except with the consent of the Councils, raise any capital in pursuance of this Act prior to the 20th day of November, 1908; and if the Councils shall give notice for such Bill as aforesaid in October or November, 1908, the Company shall not raise any capital in pursuance of this Act during the promotion of such Bill save what is necessary for carrying on the undertaking and satisfying existing obligations.

(4) The expression "the undertaking of the Company" includes all the gas-works, engines, mains, pipes, and machinery, lands and buildings, plant fixed and movable, and all the other the real and personal property, assets, and effects of whatever nature, and all the rights, powers, and privileges vested in, or belonging to, or had or enjoyed by, the Company at the date of the transfer of the undertaking of the Company to the Board, except cash in hand or with their bankers, book debts received or due on credit or revenue account, and except any profits then to be divided, and except books and papers relating exclusively to the shareholders in and the constitution of the Company, and also except movable stock-in-trade, gas coal, and other stores, which shall be taken over by valuation at the date of the transfer.

The model clause, as settled by the Lord Chairman, dealing with the issue of shares by auction or tender (see *ante*, p. 711) was ordered to be inserted in the Bill as reported to the House.

SWANSEA VALLEY GAS BILL.

House of Lords Committee.—Tuesday, March 10.

(*Before Lord* SANDERSON, *Chairman*, *the Earl of* WESTMORLAND, *Earl* GRAHAM, *the Earl of* CRANBROOK, *and Viscount* HOOD.)

The object of this Bill is to incorporate and confer certain powers on the Swansea Valley Gas Company.

Mr. BALFOUR BROWNE, K.C., and Mr. TREVOR LEWIS appeared for the promoters. The petitioners against the Bill were the Swansea Rural District Council, represented by Mr. G. J. TALBOT, K.C., and Mr. A. M. PADDON, and the Swansea Gaslight Company, represented by Mr. SZLUMPER.

Mr. BALFOUR BROWNE, in opening, said the area which the promoters sought to supply was a valley 13 miles in length, at present very inadequately served by two small undertakings at Ystalyfera and Pontardawe, both of which it was proposed to absorb in the new Company. The capital originally suggested was £50,000; but to meet the views of some of the local authorities, this had been reduced to £30,000, with borrowing powers up to £10,000 more. After this concession was made, most of the opposition to the Bill disappeared; the only petitions remaining being those of the Swansea Gaslight Company and the Swansea Rural District Council. In their petition, the Swansea Gaslight Company alleged that they would be injuriously affected by the Bill because of the confusion which was likely to arise in consequence of the similarity of the names of the two concerns. No part of the area the promoters proposed to supply was within that of the Swansea Gaslight Company. They claimed that they were incorporated in the reign of George IV.; and they submitted that the adoption by the promoters of a name or title so closely resembling their own would be prejudicial to their interests. The reply to this was, of course, that the name selected exactly described the area the promoters desired to supply. The petitioners had no monopoly of the word Swansea. In any event, the two titles were quite distinct. The petitioners further pointed out that already a mistake of the kind suggested had been made by a leading London financial newspaper, which, on Feb. 9 last, referred to the "Swansea Gas Bill" as having passed the second reading. Well, he was not responsible for that. The Swansea Rural District Council no doubt had grounds for appearing before the Committee, because the Company proposed to come into their district; and there were two little parishes—Glais and Llansamlet—which they desired to exclude from the area of supply. He asked their Lordships not to listen to this petition, because these places were without any gas or electric supply; and unless the promoters came into the area, they would be left in absolute darkness. The Rural District Council had no power of supply.

Mr. *E. H. Stevenson*, examined by Mr. TREVOR LEWIS, said he was well acquainted with the area proposed to be supplied by the Bill. Of the two undertakings to be absorbed, the Pontardawe Company was not a statutory concern; but the Ystalyfera Company was. This Company was transferred to the present owners, the promoters of the Bill, by an Order of the Board of Trade in 1907. Up to that time they had charged 5s. 6d. per 1000 cubic feet for gas. The present Company had reduced the price to 4s. 9d. When the new works were made, he expected an immediate consumption of 20 million cubic feet of gas. It was intended to erect the new works at the southern end of the valley, within the area of the Swansea Rural District Council, and to retain the existing works at Pontardawe and Ystalyfera, to be used as distributing centres.

In cross-examination by Mr. SZLUMPER, witness said he was not responsible for the adoption of the title of the Bill. He knew the district very well, and had been employed by the Swansea Gas Company more than once. He admitted that if they were to encroach upon the area served by the Swansea Gas Company, it would be a very serious inconvenience to have two Companies with practically the same name serving one district.

Mr. *Reginald B. Silcock*, the Engineer and Manager of the Garw and Ogmore Gas Company, said he had known the Swansea Valley ten or twelve years, and was well acquainted with the scheme of the promoters. It was essential to the economical supply of gas to the district that new works should be erected at the southern end of the valley; and he agreed that the existing works should be used as distributing centres. He considered the standard of price fixed in the Bill—viz., 4s. 9d., to be reduced in two years to 4s. 6d.—as fair and reasonable having regard to all the circumstances of the district. All the coal in the neighbourhood was anthracite; and the Company would have to obtain gas coal from a place 25 to 30 miles away.

In cross-examination by Mr. SZLUMPER, witness said he knew the Swansea Gaslight Company very well. He agreed that the shares were much sought after, and that anything that detracted from the value of the shares would be a serious thing for the shareholders. It did not strike him that there was great similarity between the names of the two Companies. No one in his right senses could mistake one from the other. His attention had been drawn to the "Financial Times" of Feb. 9 last, which stated that the "Swansea Gas Bill" had been read a second time; but he did not think that this showed that people would mistake one Company for the other. The boundary of the Swansea Gas Company's area was the boundary of the town of Swansea.

Mr. SZLUMPER: Do you know that the Swansea Corporation contemplate extending their area?

Witness: No.

If they did extend their area, they would come into the district you are now seeking power to supply?—Do you mean that the Swansea Gas Company would apply to increase their area?

No; it would increase automatically, to within one mile of the Corporation boundary. You did not know that?—I did not.

Mr. *Wm. Davies*, of Pontardawe, said he was well acquainted with the places supplied by the Pontardawe and Ystalyfera Gas Companies. The district was developing very rapidly; the population having increased by about 10,000 since 1901. As an independent ratepayer of the district, he should welcome the passing of the Bill.

Mr. *John Lewis Williams*, of Pontardawe, gave similar evidence. He stated that since the present owners took over the Pontardawe Gas-Works the price of gas had been reduced from 5s. to 4s. 9d. per 1000 cubic feet.

This concluded the case for the promoters.

Mr. *George Thornton Andrews*, the Manager of the Swansea Gas-Works, in reply to Mr. SZLUMPER, said that his Company was incorporated in the year 1834, and was re-incorporated in 1851. He had seen it stated that it was the intention on the part of the Swansea Corporation to extend the area of the borough.

Mr. SZLUMPER: When the boundary is extended, whatever portion is taken in will be within your area of supply, and you will be prepared to supply gas within that extended area?

Witness: Yes.

If the extension proceeds in a northerly direction, will it take in some of the area covered by the present Bill?—Yes; we already supply some portion of that area.

In further examination, witness said the Swansea Gas Company supplied a population of 100,000, who consumed 451 million cubic feet of gas per annum. The existing capital of the Company was £322,000 in shares, and £67,900 loan capital.

Cross-examined by Mr. TREVOR LEWIS: He did not suppose the credit of the Swansea Gas Company would be impaired by the incorporation of the proposed Company; and he did not anticipate any difficulty in disposing of stock.

Mr. SZLUMPER then addressed the Committee on behalf of the Swansea Gas Company. He stated that their shares stood at a considerable premium, and urged that nothing that would detract from their value should be allowed to pass the House. The promoters had shown no cause for having their Bill called the Swansea Valley Gas Bill. He did not like to suggest that they had adopted this title because they would receive some halo from the Swansea Gas Company; but if that was not the case, there could be no reason why these people should not call themselves something that would better describe their position in that part of the country, and would not interfere with an old-established business like the Swansea Gas Company. Only the most cheerful optimism could suggest that these people would for many years pay anything like a dividend on their shares. They were taking in an area of most sparsely populated country; they were absorbing two Companies who had in the past found the greatest difficulty in

paying their way; and they might soon find themselves in very much the same position. If a company with a name so similar to their own came into their district as a competitor, he had no hesitation in declaring that the Court would interfere and prevent them using the name. The Committee was the only Court to which he could appeal; if they passed this Bill, he would have no redress.

Mr. TALBOT, on behalf of the Swansea Rural District Council, asked the Committee to exclude from the Bill the two parishes of Glais and Llansamlet. The proposed Company could not supply gas to these parishes at anything like the price at which it could be furnished by the Swansea Gas Company; and he did not believe there was any serious intention to supply the district at all. The Council desired to be able, whenever the interests of the district demanded it, to make arrangements with the Swansea Company; and he asked their Lordships to make it a condition of the passing of the Bill that these two parishes should be cut out of the area.

Mr. TREVOR LEWIS briefly replied on behalf of the promoters; and the room was cleared.

When the parties were re-admitted,

The CHAIRMAN said the Committee were of opinion that the Bill might proceed. They did not think it necessary to make any alterations.

Wednesday, March 11.

The Bill came up this morning for the adjustment of clauses; and the measure passed through the Committee, and was ordered to be reported to the House for third reading.

LLANELLY GAS BILL.

House of Lords Committee.—Tuesday, March 10.

(*Before Lord* SANDERSON, *Chairman, the Earl of* ELDON, *the Earl of* WESTMORLAND, *Lord* BELHAVEN AND STENTON, *and Viscount* HOOD.)

This is a Bill promoted by the Llanelly Gaslight Company to authorize the raising of £84,166 additional capital, and for other purposes.

Mr. POLLOCK, K.C., Mr. HUTCHINSON, and Mr. SZLUMPER appeared for the promoters; and Mr. HONORATUS LLOYD, K.C., and Mr. MACASSEY represented the Llanelly Urban District Council, who petitioned against the Bill.

Mr. POLLOCK said the Llanelly Gas Company was a very old undertaking, having obtained their first Act of Parliament in 1835, when they started with the small capital of £2000. Between 1835 and 1874 they spent £12,720 out of the profits of the undertaking. When the Company came to Parliament for a Bill in 1874, they repealed the Act of 1835, which fixed the limits of supply as "any place within the county of Glamorgan within a radius of five miles from the entrance door of the Town Hall of the borough of Llanelly." Under the Act of 1874, the capital was increased to £50,000. From that time to this the Company had not been to Parliament; but now they needed additional capital to strengthen the undertaking and meet their requirements. Under the Act of 1874, the dividends authorized were 5 per cent. on the whole of the capital; and all profits above 5 per cent. were to be divided *pro rata* in the following proportions: 10 per cent. on the original capital; 7 per cent. on the capital raised under the Act; and 5 per cent. on the £12,720 expended between 1835 and 1874. The price of gas was fixed at the maximum of 5s. 6d. per 1000 cubic feet within the borough and 7s. outside. At present the property comprised gas-works erected on 2½ acres of land, about 22 miles of main in the town of Llanelly, and four miles going in the direction of Burry Port. The gas-works were practically in the centre of the town. The consumption last year amounted to 60½ million cubic feet. The capital worked out at about £1000 per million feet sold. This was rather high; but it was accounted for by the extended district and the fact that the mains had been laid a very long time, and were not in a modern condition. It was not an uncommon thing to find in old gas-works that the capital was something like £1000 per million cubic feet sold. In recent years the electric light had been used in some of the big works in the district; and there was no doubt that the Company had not now the large users of gas they had before the electric light came into use. They were, however, making up for this by doing a larger business with small consumers; and it was just this business which compelled the Company to spend more money in the provision of slot meters. Though this was good business, it required a great amount of capital. Out of 10,000 houses in their district, the Company were only supplying 2500. The population of Llanelly was about 30,000, and was increasing every year. The cost of the extension to Burry Port was £4500—an expenditure of capital rendered necessary by the Burry Port Local Authority, who threatened to start a gas supply of their own if the Company did not fulfil their obligation. In fact, the Local Authority went so far as to promote a Bill in Parliament. The Company were now asking sanction to the creation of an additional £60,000 of stock, which would be issued under the auction clauses. Whatever price the stock fetched, the total amount was not to exceed £60,000. At present the works were just equal to the output. Their greatest daily consumption of gas was 366,000 cubic feet; and their retorts, if properly worked, could actually produce 372,000 cubic feet. They were really working up to the maximum of their retort capacity; so that with an increased demand they would have to spend something on the works themselves. In a few years' time they estimated they would require £77,000 of additional capital. Beyond the £60,000, they asked for power to raise the statutory one-third by loan—viz., £20,000—and also to bring up the loan capital on the old share capital to the statutory limit by the issue of another £4166; making the total amount of the new capital £84,166. Hitherto the Company had not been earning anything like their maximum dividend; but they were now prepared to introduce the sliding-scale. The standard price was fixed at 4s. 3d. per 1000 cubic feet inside the town of Llanelly, and 4s. 6d. outside. He understood the Urban District Council would ask the Committee to make a reduction; but he thought he should be able to show that the price was reasonable and just. At present the Company were charging 4s. 1d., and were paying a dividend of 5 per cent. For the last five years they had paid 5 per cent.; but on an average of years they had only paid 3½ per cent. The promoters desired to get rid of an obligation under which they were placed by their Act of 1874, to allow the Llanelly Urban District Council to appoint a Director on the Board of the Company. The arrangement was made when the Local Authority were seeking powers to purchase the undertaking; but that time had gone by, and there was no justification for the continuance of the obligation. There were eleven different local authorities in the district served by the Company; but only one of them was opposing the Bill. The petitioners alleged that the proposed increase of capital was not justified; that the auction clauses should be applied to the loan capital as well as to the share capital; that the Company had refused to supply gas to public-lamps; and that the proposed maximum standard for the gas was too high and ought to be reduced.

Mr. *H. E. Jones* said he had advised the promoters in regard to the Bill. He had visited the works and made himself acquainted with all the circumstances of the district. Having regard to the state of the undertaking, he considered it absolutely essential that the Company should have a considerable amount of new capital at once. In his judgment, £84,000 was a very proper figure at which to place the new capital. The Company at the present time had overspent to the extent of £5000. He found in the town and district large numbers of houses to which the slot-meter system had not been applied. Consumers were waiting for gas. Only 2500 out of 10,000 houses in the district were supplied. He estimated the capital required at £700 per million cubic feet of gas sold. There was a very popular error that because there was coal in Wales therefore gas coal must be cheap in Llanelly. As a matter of fact, the price of gas coal had varied from 15s. to 17s. 4d. per ton; and he saw no immediate prospect of such a reduction as would justify the lowering of the standard price of gas named in the Bill. The application of the sliding-scale would be of advantage to both the consumers and the producers of gas. There was no ground for the suggestion that the illuminating power would be reduced.

In cross-examination by Mr. HONORATUS LLOYD, witness said the additional capital asked for in the Bill would only last six or seven years. He did not base his estimate of the future growth of the Company on that of past years. In his opinion, a fair amount of additional capital to allow for 12 or 14 years, having regard to the experience of the past, would be about £60,000.

Wednesday, March 11.

When the proceedings were resumed to-day,

Mr. HUTCHINSON intimated that the Committee would not be troubled in the matter of the Director whom the Urban District Council were entitled, under the Company's present Act, to appoint—a satisfactory arrangement having been arrived at.

[It transpired that the arrangement was that the Urban District Council waived their right on the understanding that they were furnished with the Auditor's certificate that the Company were supplying gas for public lighting at a price at least as low as was charged to any other consumer.]

Mr. *Jones* then resumed his evidence. In reply to Mr. HUTCHINSON, he said, in his opinion, the capital asked for was fully justified by the probable increase in the business in the near future. There were 7500 houses in the district unsupplied with gas. There was no inducement to inflate capital when it was issued under the auction clauses.

Mr. *Thomas Acland*, the Secretary and Manager of the Company, stated that during the past five years the number of consumers had increased by 1104—equal to 9 per cent. The gas sold had increased from 53 million cubic feet to 61½ millions. The increase would have been greater but for the economy practised by the Local Board in reducing the hours of lighting and diminishing the number of public lamps. In 1902, the authorities dispensed with 33 gas-lamps and substituted six Kitson lights. The increased consumption in the last two years had been considerable. The Company had every reason to expect great developments at Burry Port, which, with Pwll, contained 950 houses. There had been some disputes on the question of public lighting with the Local Authority, who tried to compel them to supply gas to public lamps more than 50 yards from the mains, which was the statutory limit.

Mr. MACASSEY: What do you understand is your obligation in regard to public lighting. You agree that you are under an obligation to light public lamps within 50 yards of any main. Do you agree that if the first lamp is 50 yards from the main you are bound to light a series of lamps if they are not more than 50 yards apart?

Mr. POLLOCK: Yes, I will admit that; and I am ready to repeal our clause and rely on the general law. You can then have arbitration.

In further cross-examination, witness stated that slot-meters were first fixed by the Company in 1903, when 300 were issued. They had altogether 532 in use.

Replying to Mr. MACASSEY, witness said they should put the slot meters in £12 houses, not in cottages let at 2s. 6d. a week. They had not been able to accede to all the applications for these meters, because they had not sufficient capital.

Mr. *E. H. Stevenson* gave evidence in support of the Bill. The Company had, he said, lost the sale of 5 million cubic feet of gas through the action of the Local Authority in reducing the number of public lamps and in substituting incandescent for flat-flame burners. In spite of these losses, the gas consumption increased 4 per cent. in 1906 and 8½ per cent. in 1907. The works were in good condition. He contended the Company were justified in asking for an increase of £84,000 in capital, and that 4s. 3d. was a fair standard price for the gas. He produced a piece of iron gas-main which had been very much injured by the corrosive action of the soil in which it was embedded, which largely consisted of copper and iron slag. This action he believed accounted for the exceptional quantity of unaccounted-for gas in the Company's books.

This closed the case for the promoters.

Mr. *William Cash*, examined by Mr. MACASSEY, said he had been through the accounts of the Company, and had come to the conclusion that the new capital asked for was greatly in excess of their require-

ments. He estimated that in the next twelve years they would want £24,250, which would include £5000 to pay off the overdraft. He made his estimate on the basis of £700 per million feet of gas sold.

In cross-examination, witness admitted he had not been to Llanelly, and was not acquainted with the local conditions.

Mr. *Charles Hunt* said he had visited the district, had inspected the works of the Company, and had made an estimate of the future capital requirements of the undertaking. In his opinion, the amount of capital required to enable them to carry on their business for 12 or 14 years was £31,000.

Mr. HONORATUS LLOYD then addressed the Committee on behalf of the petitioners, contending that they should insist upon the new capital being limited to £26,250. If the Company got this £84,166, they would go back to Llanelly rejoicing in the fact that they would not have to come to Parliament within the next half century. The Urban District Council were willing and anxious that the Company should have capital sufficient to enable them to carry on their business properly and adequately during the next twelve years; and in asking their Lordships not to grant them more than this, he was following the usual practice, which would compel them to come again to Parliament at the proper time. With regard to the standard price, he submitted that 4s. 3d. was much too high. He would rather have no sliding-scale at all and revert to the old maximum charge than agree to the insertion of a standard price of 4s. 3d. He submitted that the standard should be 3s. 8d. inside Llanelly and 4s. 2d. outside.

Thursday, March 12.

Mr. POLLOCK, addressing the Committee on behalf of the promoters, said there were now only two points at issue—first the amount of capital the Company ought to have, and, secondly, the standard price.

Mr. HONORATUS LLOYD: On the preamble.

Mr. POLLOCK: Yes. In regard to the capital, their Lordships would recollect the evidence of Mr. Jones, which was based on a careful inspection of the gas-works themselves, the district within which the Company would be able to supply, and on his large experience as Manager of the Commercial Gas Company. He stated that the average consumer took 22,300 cubic feet of gas per annum, that there were 9670 houses in the district, three-fourths of which he estimated the Company ought to supply with gas. This gave them 7250 possible consumers. The absolute number of consumers at the present time was 2550, which left 4700 people who would be willing to take gas if they had the opportunity—an additional consumption of 104 million cubic feet. A peculiar feature of the evidence was that it was not based on a hypothetical increase due to the natural development of the district. Mr. Jones's evidence came to this: He said, in effect, "I am dealing now with a town where the proper way of cultivating gas business has not been fully carried out because the Company have not had the capital to do it. I say if I had the capital I should be selling within a few years 104 million feet of gas more than I am supplying now; but I cannot supply that with a capital of less than £700 per million." He asked their Lordships to ignore the evidence of Mr. Cash, who admitted that he had never been to Llanelly, and of Mr. Hunt, who was only inside the gas-works for 20 minutes, and spent the remainder of his short visit in driving about the district. If Mr. Jones was right, there was already this large field for increase. But, in addition to this, they had it in evidence that the houses were increasing at the rate of 200 per annum. It was quite clear the promoters had made out their case for the additional capital they asked for. With reference to the standard price, it had been shown that the almost invariable practice of Parliament had been to add a small sum of 1d. or 2d. to the price at which the Company had been working in past years. It was quite obvious that they must provide a margin if they hoped to induce investors to put their money in the undertaking. Unless they had a margin, in the event of a strike or a heavy rise in the price of coal, the shareholders would possibly get no dividend at all.

The CHAIRMAN: There is a difference between you on one point. You say Mr. Jones said Parliament added something to what had been actually charged. Mr. Hunt said Parliament added something to what the theoretical price ought to be.

Mr. POLLOCK said his Lordship was quite right. Mr. Jones's contention was that Parliament added something to the actual price of gas. Continuing, the learned Counsel said the effect of the sliding-scale would be to induce the Company to exercise economy, because they would be equally interested with the consumers in keeping down the price. If they cut down the standard so low that the sliding-scale could not be effective, there was no inducement to the Directors to practise economy. With the price at 4s. 1d., the Company had never paid their maximum dividend. They had only paid 5 per cent. for five years; and in the five years previous to that, they did not pay 5 per cent. The witnesses for the Urban District Council had based their calculations on the assumption that 9000 cubic feet of gas would be obtained from every ton of coal carbonized; but, as a matter of fact, the Glamorganshire coal only produced 8300 feet. What right had Mr. Hunt, with limited knowledge of the district, to say they could make 9000 feet? Mr. Cash, in his evidence, overlooked the fact that they had to contend with an abnormal leakage of 15 per cent., due to the peculiarities of the soil and the subsidence incidental to a colliery district. He doubted whether it would ever be possible to reduce the leakage below 14 per cent.

The room was then cleared; and when the parties were re-admitted,

The CHAIRMAN said: We have here a report from the Local Government Board, which I think ought to be attended to. In reference to clause 4 and clause 27——

Mr. POLLOCK: They have been altered.

The CHAIRMAN: The Committee are of opinion that the Bill should proceed, but that the additional share capital should be limited to £45,000, with borrowing powers up to one-third (£15,000), and the additional borrowing powers on the old capital (£4166); making £64,166 in all. As regards the sliding-scale, we think the standard of 4s. 3d. may remain; but the clause will require some adjustment, which I think may be done by agreement.

Mr. POLLOCK: Very good, my Lord.

The adjustment of the clauses was postponed.

MISCELLANEOUS NEWS.

BIRMINGHAM GAS-WORKS STAFF DINNER.

Mr. Hack's Forthcoming Retirement.

The works staff of the City of Birmingham Gas Department held their fourth annual dinner and concert at the Acorn Hotel, Temple Street, last Saturday evening, when a party some fifty strong spent a most enjoyable evening; both the dinner and the entertainment which followed leaving nothing to be desired. The Chairman was Mr. T. H. Hack, Works Engineer at Swan Village; and among those present as visitors was Mr. J. W. Morrison, of Sheffield.

The Chairman proposed the Loyal Toast; and the next—"The Department and Our Chief"—was proposed by Mr. F. J. Bywater, Works Engineer at Saltley, who remarked that few words of his were needed to commend it to all those present. The staff in Birmingham received every consideration. In fact, he did not believe there was any body of employees in the country who were dealt with better than they were by the Gas Committee and the Executive officers of the Committee. They as a staff, he thought, were equally loyal to the department. They really did honestly try to do their best for those who employed them. Mr. Morrison, whom they were all glad to see there that night, was selling very cheap gas indeed; but he was sure he did not make better gas, or more honest gas, than they did in Birmingham. The staff also rendered loyal service to their chief. It was common knowledge to all of them that this was the last occasion on which they would have the pleasure of linking the name of Mr. Henry Hack with this toast. Mr. Hack was going from them into retirement; and they were losing a great personality. They were losing a man who for over thirty years had, to the best of his endeavour and the utmost of his power, served the citizens of Birmingham. When Mr. Hack went into retirement, he was sure he would do so with every good wish from the staff. Those who knew him best knew how he had worked for the department, to the service of which the whole of his time had been given. They regretted not to have him with them that night—especially as his absence was on account of his health, which had for some time past not been very good. He asked them to join with him in drinking to Mr. Hack's good health, his better health, and his best health in his retirement.

The toast having been enthusiastically drunk with musical honours, the Chairman, in response, said he wished some members of the Committee had been present to hear the remarks of Mr. Bywater. They would have much appreciated them. He was sorry also that Mr. Henry Hack had been unable to attend. He had sent a letter regretting his inability to be present owing to indisposition, and asking him (the Chairman) to convey his best wishes to the gathering, and the hope that a pleasant and enjoyable evening would be spent. Had he heard them, he would have been deeply touched by Mr. Bywater's kind words. He was quite sure that when Mr. Hack retired he would feel the severance as much as, or more than, would the staff. The department, he was confident, highly valued their servants; and he was convinced that both the staff and workmen were equal to the best in the country. All strived to obtain the finest results possible; and the department fully appreciated their efforts.

The toast of "The Visitors" was proposed by Mr. Hargroves, who coupled Mr. Morrison's name with it. Mr. Morrison, in response, said he was very glad to receive from the Secretary an invitation to attend the gathering, because he felt sure he would have the pleasure of seeing some old friends; but he was sorry not to meet Mr. Hack. Referring to the Midland Junior Association, he said the members had contributed some papers which had been read with great pleasure by the senior members of the fraternity.

The remaining toasts were "Success to our Annual Dinner" (with which was associated the name of Mr. Arthur Allen, who had performed the duties of Secretary), proposed by Mr. E. Evans, and responded to by Mr. Allen; and "Our Chairman," proposed by Mr. E. H. Harman, and seconded by Mr. J. H. Darrah. The latter toast was responded to by Mr. T. H. Hack.

SHEFFIELD UNITED GASLIGHT COMPANY.

The Ordinary General Meeting of this Company was held on Monday of last week, under the presidency of Mr. WILSON MAPPIN, J.P., the Deputy-Chairman. The report and accounts submitted were noticed in the "JOURNAL" for the 18th ult. (p. 434).

The DEPUTY-CHAIRMAN, in moving their adoption, said that the accounts, taking all the circumstances into consideration, were as favourable as any that had ever been issued by the Company; the increase of gas sold during the half year ended Dec. 31 having been particularly high—amounting to no less than 8·13 per cent. Coming on the top of the large business already done by the Company, this was an indication that the very low price at which they were able to sell gas was greatly appreciated by the consumers, and was leading more and more to its use for manufacturing purposes, and to its extended adoption by small householders. This was shown by the fact that out of 4290 additional meters fixed by the Company during last year, no fewer than 4216 were three-light ones, which was the smallest size that was now fixed—proving that cottage householders were no longer content with the feeble, troublesome, and expensive light they had been in the habit of obtaining from oil-lamps, when they could, at a small outlay, have their rooms brilliantly illuminated by an incandescent burner consuming 4 cubic feet of gas per hour, and giving a light of from 50 to 60 candle power at a cost of 1d. for 15 hours' consumption. The number of tests made by their own officials and the City Corporation Chemist in the period under review had been 1157, with an average illuminating power of 17·43 candles; the total number

of tests carried out during the twelve months having been 2289, with an average illuminating power of 17·41 candles. The quantity of coal carbonized was 164,543 tons, or an increase of 13,458 tons on the corresponding period of 1906; and the amount paid for the coal was £28,807 more, which was due to the increased price the Company had had to pay and the extra quantity used. Stokers' wages were £1405 more, rates £576 more, and stationery and printing £135 more. Repairs of works, on the other hand, had been less by £3784, and repairs of mains and services less by £696. The income showed several increases. Gas had yielded £1408 more, notwithstanding the fact that it was sold at 1d. per 1000 cubic feet less than during the corresponding half of the previous year—the increase, of course, being due to the additional quantity sold. Meter and stove rents showed an increase of £405, coke an increase of £10,551, sulphate of ammonia an increase of £1452, and earnings by the Company's railway-waggons an increase of £140. There had been a decrease in receipts for tar of £643, and of £163 in the profit on the fitting department. The net result was that, to pay the dividend, £2683 had to be taken from the undivided balance at the end of June, which would leave the sum of £95,551 to be carried forward. Among the additional meters that had been fixed were eighteen of 100 lights, thirteen of 150 lights, three of 200 lights, five of 250 lights, six of 300 lights, six of 400 lights, one of 600 lights, and one of 800 lights; and the total number of meters in use on Dec. 31 was 90,880. During the past six months, 1314 gas-fires had been sold, 948 boiling and other stoves, and 14,613 incandescent burners; and 162 additional cookers had been let on hire. Of gas-engines, 75 were fixed last year, varying in size from ½ to 500 H.P. At the last meeting of the City Council, the question of lighting the Attercliffe Baths was under consideration; and a statement was made by one of the councillors that the lighting of the Glossop Road Baths by electricity cost £120 per annum, whereas formerly the cost of lighting by gas was only £40 per annum. It did not seem to him right that the ratepayers' money should be wasted in this extravagant manner; and as the Company were the largest ratepayers in the town, he thought he was justified in drawing attention to the matter. He noticed that at Islington, where only 20 miles of road were lighted by electricity at a cost of £5245, 100 miles of road were lighted by gas at a cost of £4077; and if the 20 miles had been served with gas lighting, the cost would have been only £1049. In Camberwell, the street lighting cost £90 per mile annually for gas lighting, as against £170 for electricity in neighbouring districts; and gas in London was more than double the price charged in Sheffield. He mentioned these matters so that the Corporation might reflect before increasing the lighting rate of Sheffield unnecessarily, as the rates of the city were surely high enough. In his opinion, until the compounding of rates was done away with, and tenants paid their own rates, instead of the landlords doing so as at present, and recouping themselves in their charge for rent, he was afraid the working classes would never think of the money which was thrown away by having electricity for street lighting. A subject of great concern at the present time was the Miners' Eight Hours Bill, which had been introduced by the Government. Should the Bill pass into law, the effect would probably be to make coal permanently dearer. This would not touch them as shareholders, as the price of gas could be more than doubled before their dividends would be affected. It was, however, a very serious matter for the manufacturers of the town, and also for private consumers of all classes; and he was surprised that the question had not been taken up more seriously by the community generally. This was the first occasion on which any Government had attempted to interfere with adult male labour; and he could not understand men allowing their liberty to work to be restricted by Act of Parliament.

The report was adopted, the usual maximum dividend was declared, and a vote of thanks was accorded to the Deputy-Chairman, the Directors, and the officials of the Company.

THE GAS-WORKS EXPLOSION AT BIRMINGHAM.

Conclusion of the Inquest.

The inquest on the bodies of the two labourers, George Willis and Alfred J. Ward, who lost their lives as the result of an explosion at the Windsor Street Gas-Works of the Birmingham Corporation on Sunday, the 1st inst. (*ante*, pp. 580, 647), was concluded last Wednesday, by the City Coroner, Mr. I. Bradley. Mr. Prideaux (for the Corporation), Mr. G. Hampton Barber (the Secretary of the Gas Department), and Mr. Henry Hack (the Chief Engineer) were present, as was also Mr. R. E. Graves (Inspector of Factories). Mr. Willison watched the proceedings on behalf of the Gas-Workers' Union. The inquiry had been adjourned to admit of the attendance of Charles Egginton, who was injured by the explosion.

Several of the men employed on the works were first called to give evidence as to the condition of the various valves at the time of the accident. Samuel Clarke, foreman carbonizer at the works, said gas manufacturing ceased at 6 o'clock on the Sunday morning; and he shut off the gas by closing the inlet-valve of the "Standard" washer-scrubber at 10.45. This would prevent any large quantity of gas from returning towards the Livesey washer, where the explosion occurred. No one would touch that valve without getting instructions from him. William Bartlett, a valve-man at the works, said he closed the valve at the meter at 10.45. William Otton, engine-driver at the exhauster-house, said he had instructions to shut down his engine at 10.45. After that the gas would be dormant in the pipe. He noticed no smell of gas when the pipe had been cut by the deceased men. The valves remained closed till after the accident. He did not see anyone smoking in the neighbourhood of the exhauster-house. In answer to Mr. Willison, witness said the deceased men had brought a plug to stop up the hole in the pipe, but had not inserted it when the accident happened. Leonard Woodman, another valve-man, said he heard the explosion at 2.20, and ran towards the exhauster-house. He saw the trench full of flame. Egginton came out of the exhauster-house, and stated that his two mates were down the hole. Witness afterwards examined the inlet-valve of the washer-scrubber and the meter. They were both closed quite tight. Mr E. B. Tomlinson, Assistant Works Engineer, said he went to the trench after hearing the explosion, and found the hole so full of flame that it was impossible to get down. He sent for the fire hose, and saw that the valves were closed. The Livesey washers, however, had been blown to pieces, and the liquor had run away. The pipe leading from them had also burst.

Mr. William Hawtin, general foreman at the works, stated that he gave instructions to Egginton for the cutting of the pipe between the Livesey washer and the exhauster-house. After the engine had been stopped in the exhauster-house, he went to the Livesey washer, and found that the seal was all right. There was then 2-10ths pressure on the main which they were going to disconnect. He saw the pipe cut and attached to the chains of the lifting apparatus. Then he went to dinner, and returned about 2.20. He was near the valve-man's hut when the explosion occurred. He ran to the exhauster-house, and saw a flame 6 feet high curling out of the hole. He managed, however, to get down as far as the first timbers; but a rush of flame drove him out. In answer to Mr. Graves, witness said there was very little gas in the main when the pipe was cut; and there had been plenty of time for it to escape before the explosion occurred. Mr. Willison asked whether it would not have been possible to have put something into the socket of the pipe, to prevent the gas escaping from the washer; and a Juror suggested that air-bags might have been used. Witness pointed out that air-bags could not be got in without cutting the pipe in another place, where the danger would be the same. Mr. Willison elicited that there was a valve between the Livesey washer and the exhauster-house which was not closed. Witness said there was no reason why it should not have been closed, except that he did not think it necessary to close it, seeing that the pipe was closed at each end, and there was practically no pressure. Re-examined by Mr. Prideaux, witness said there would have been less gas in the pipe if the other valve had been closed; but it was more dangerous to have a small quantity of gas in the pipe than a large amount. He did not think air-bags would have prevented the explosion, because the rubber covering of the bag would have been dissolved by the tar in the pipe in about half-an-hour.

Charles Egginton, foreman pipe-layer, said he had charge of the job, and had the chains attached to the pipe before he began to cut it. First he used a diamond drill, then a chisel, and finally drove a wedge in to split the pipe. It left a spigot-piece in the socket at the top, which he had to cut out with a hand hammer and chisel. There was little gas to contend with until after dinner. There was some tar and liquor running out of the socket. He instructed Willis to scrape the tar from the opening, so that Ward could get the spigot-piece out of the socket. He told Ward he would only have to tap it with his hammer, which weighed about 3 lbs. Ward did so, and then there was a flash. He remembered nothing after that, and did not know how he got out of the hole. There was no artificial light in the hole before the explosion; and no one was smoking. By Mr. Willison: If there was a valve only 20 feet from the hole, he would certainly have expected it to be closed; but it would not be necessary if the Livesey washer was sealed.

Mr. John Foster, Works Engineer at Windsor Street, explained the system of valves and seals, and said that when the engine was working the gas in the pipe was under vacuum; but when the valves were closed, the gas lay dormant at atmospheric pressure. If an explosion occurred where the men were working, it would travel back to the Livesey washer and burst it. The flame would return to the trench, and set light to the tar which was trickling out of the pipe. A spark from a hammer would have to be an exceptionally large one to ignite the gas. He did not think anything could have been done to prevent the explosion. He was very thankful the valve mentioned by Mr. Willison was not closed; for if it had been, the explosion would have burst the pipe instead of bursting the washer, in which case Egginton would probably have been killed. In answer to Mr. Willison, witness said air-bags had been used at the works; but he did not think it would have been safe to employ them on this job. To get them in, it would have been necessary to cut two holes in the main-pipe; and this would be more dangerous than the actual work that was required to be done. A serious explosion occurred at Manchester through gas-bags being melted or displaced by the tar in the pipe.

The Jury returned a verdict of "Accidental death."

Mr. Willison, on behalf of the gas workers, expressed admiration of the efforts of the firemen who entered the blazing trench and endeavoured to rescue the two men; and Mr. Prideaux and the Coroner endorsed this.

Complaints of a Coke-Conveyor from Nine Elms.—At the meeting of the Battersea Borough Council last Wednesday, the Law Committee reported having considered a letter from Mrs. C. Despard, forwarding a memorial from 273 residents in the Nine Elms district with reference to a nuisance caused by a coke-conveyor recently erected by the Gaslight and Coke Company. The Committee obtained the opinion of the Solicitor on the question of the power of the Council in the matter, and in the meantime instructed the Medical Officer of Health to deal with the subject from the sanitary point of view. As the result of representations he made, the Company have carried out certain works which will probably remedy the nuisance to some extent. The Medical Officer is to watch the progress of events, and take such action as he considers necessary.

Gas Pressure in Wandsworth.—At the meeting of the Wandsworth Borough Council on Wednesday, a letter was received from the Secretary of the Mitcham and Wimbledon Gas Company, in reply to a communication from the Council forwarding a copy of a report by the Gas Examiner on the pressure of the gas supplied by the Company (see *ante*, p. 189). The Secretary stated that the Directors thought the Company's standard of pressure was only what was adequate and necessary, and was not in any degree too high. The report of the Gas Examiner submitted to the Council showed that on Feb. 28 the pressure of gas was 3·3 inches, against 2·5 inches on the same day by the Wandsworth and Putney Gas Company. Other recent tests of the latter Company's gas gave the pressure as 2·3, 2·7, and 2·8 inches. No action was taken in the matter.

PROVINCIAL GAS AND WATER COMPANIES.

Gas.

Improved Works and Lower Price at Aberdare.

At the 77th half-yearly meeting of the Aberdare and Aberaman Gas Company, the Chairman (Mr. Benjamin Jones), in submitting the statement of accounts for the year ended the 31st of December, said that the results obtained had been very favourable, especially in view of the heavy difficulties thrown upon the Directors by the inflated condition of the coal market, and considering that during the year they had carried through a large amount of extraordinary work in alterations and extensions to the plant. The improvements effected had practically remodelled the works, and more than doubled their producing capacity. He had a high word of praise for their new Manager and Secretary, Mr. A. E. Davey, who had during his first year of office taken in hand the whole of the improvements and extensions; and the manner in which the work had been carried out reflected the highest credit upon him. He had not only done it well, but had effected a saving of some £2000 or more in the estimated costs, which were calculated upon a low basis in the first place. The economy realized was amply proved by their experience of the year 1900, when their improvements cost practically as much money for not two-thirds the amount of work as that just completed. As to the accounts, it was only to be expected that the working costs would be increased; but though these and other expenses totalled some £1100 more than in the previous year, it was extremely gratifying to find an increase in the revenue of upwards of £2020, and in net profits of £730, compared with 1906; the gross profits being £5007. The increase in consumers, in both the ordinary and prepayment departments, was satisfactory; and the output of gas showed the largest increase yet recorded, being almost 10 per cent.—that is, from about 74 million feet in 1906 to 81 millions in 1907. They had decided to reduce the price by 2d. per 1000 cubic feet from the 1st of April next, and to allow to the larger consumers special discounts of 2½ and 5 per cent. respectively for minimum consumptions per quarter of 100,000 and 250,000 cubic feet; the discounts taking effect as from the 1st of January last. They had, in addition, considerably reduced the rental charges for both meters and cooking-stoves. He concluded by moving the declaration of a dividend of 5 per cent. free of tax, as recommended by the Directors, for the half year just ended, which, with the interim dividend of 4 per cent. already paid, made a total of 9 per cent. for the year, or 1 per cent. more than for 1906. The report was adopted and the dividend declared. The Chairman then invited Mr. Isaac Carr, the Company's Consulting Engineer, to address the meeting. Mr. Carr congratulated the shareholders upon the excellent position the Company had attained, and on the improvements carried out by Mr. Davey. He said that during his varied experience he had never seen better or more sound and substantial workmanship; while with regard to the cost, considering the excellent quality of the work, he was really astonished. The Company were to be congratulated upon securing so competent and energetic an officer as Mr. Davey, who had not only proved himself capable of carrying out the duties of Secretary and Manager, but of Engineer as well; and he (Mr. Carr) felt that from that day his own services would not be required. The proceedings then closed. The improvements referred to included the reconstruction of the retort-house with a bench of eight regenerative furnaces and beds of eight 16 in. by 22 in. by 10 ft. 3 in. single retorts; coal-stores; new meter and governor house, with a new 40,000 cubic feet per hour station meter and governor by Parkinson; new oxide revivifying floor, with roof on brick pillars; and various other work, including the installation of a benzol carburettor and retort-house governor, &c. The expenditure on these works amounted to between £6000 and £7000.

A Very Small Decrease at Dover.

Mr. Willsher Mannering, the Chairman of the Dover Gas Company, in moving the adoption of the report and accounts for the half year to Dec. 31 at the recent meeting, said that, though they had not felt the high price of coal to the full extent, owing to having had a considerable quantity left over from their previous contract, the accounts showed, as compared with the corresponding half of the previous year, an increased expenditure of £1275. This was met partly by the improved value of residuals and partly by writing off a smaller percentage for the depreciation of automatic supplies—viz., 2½ per cent., against 7½ per cent. This had made a difference of £829 on the expenditure side of the account. The working charges, maintenance, and other items on the whole showed an increase of £124 (£51 of which was due to increased rates and taxes); thus making a total increased expenditure of £571. The revenue side of the account showed a decrease from sales of gas of £330. He attributed the decrease to several causes. They were passing through a period of considerable slackness and depression, especially in the building trade; and then there was the increasing use of the improved inverted incandescent burners, which gave a superior light with a reduced consumption of gas, and consequently were very much appreciated by consumers. There was also the competition of the electric light. Meter and stove rentals were £24 less, while residuals showed an increase of £536; the total increased revenue being £182. The balance carried to profit and loss account was £4735, against £5125, or a decrease of £390. After providing for the fixed charges and placing £250 to the suspense account, the net profit for the half year was £3639, which was sufficient for the usual dividend, and left a balance of £76 to be carried forward—a result which was very satisfactory. As the outcome of the whole year's working, the full dividend had been earned, the sum of £1512, or 10 per cent., had been written off for depreciation of automatic fittings, £500 had been placed to the Trevanion Street holder suspense account, and £373 had been added to the surplus profit balance, which now amounted to £4955. During the year 22,578 tons of coal had been used, against 22,870 tons in the preceding year. The quantity of gas supplied was 231,770,000 cubic feet, against 233,334,000 cubic feet, a small decrease of 1,556,000 cubic feet, equal to 0·66 per cent. In the current half year they had to face the further increased expenditure on coal; but, with their substantial reserve to draw from, the dividend was assured without raising the price of gas. There were indications of a decrease in the price of coal, unless the Miners' Eight Hours Bill came into force. It was with great regret that they had to record the loss by death of their much-esteemed colleague Mr. Alexander Bottle, who, during the fifteen years he was a member of the Board, rendered very valuable assistance in the direction of the affairs of the Company. The report was adopted; and the full dividend, at the rate of 7½ per cent. per annum, was declared. Votes of thanks were acknowledged by the Chairman, Joint Secretary (Mr. E. C. Fielding), and Resident Engineer (Mr. R. Herring).

Gas and Electricity at Hastings.

In moving the adoption of the report and balance-sheet at the half-yearly meeting of the Hastings and St. Leonards Gas Company, the Chairman (Dr. G. G. Gray, J.P.) remarked that the increase of 2d. in the price of gas as from the Christmas quarter, though unusual, was not unexpected. The rise in the cost of coal was equivalent to 2d. per 1000 cubic feet of gas. At the commencement of the present year, there was no prospect of coal becoming cheaper; and they saw no other course, in accordance with sound finance, than to raise the price of gas an amount equivalent to the increased cost of production. The last occasion they had had to raise the price of gas was eight years ago. He hoped the time during which they would have to maintain the increased price would be short. The coal market showed signs of being easier. But legislation threatened to keep the price up, and contracts were being made with stipulations that the price should be raised in case Bills which might have a tendency to raise the price should pass. Since the price of gas was originally reduced by the Company, the cost of raw material had increased no less than 100 per cent. This additional cost had not been met so much by increased sales (because they had had some decrease owing to the substitution of incandescent burners), but by economies in working, and by better results from the coal. The difference in the balance of profit compared with the corresponding half year was accounted for by a small increase in consumption, by the good price obtained for residuals, and by economy in working. There was an increase on the sale of gas for private lighting, and also from meters and heating-stoves. The growth of consumers during the past seven years worked out at 26 per cent.; but the increase in consumption came to only 8½ per cent. He attributed this to the incandescent burner. A similar effect had been felt by the Electricity Committee, in consequence of the substitution of the new metallic filament lamps. At the last half-yearly meeting, he had referred to the reduction in the price of electric current by the Corporation as unsound finance, and absolutely unjustifiable under the circumstances. What was the result? On the electricity undertaking there was a deficiency for the year ending the 31st inst. estimated at no less than £3581, or equal to a rate of 2½d. in the pound. If electricity was to be sold at under cost price, this burden on the rates would recur year after year, and must increase. Each consumer of the electric light had to be paid about £4 a year out of the rates as a sort of inducement to use the current. It was unfair that persons who did not use the electric light should be called upon to pay, in their rates, for those who did. In conclusion, the Chairman mentioned that Mr. C. E. Botley, the Engineer and General Manager, was away representing the interests of the Company on the deputation to the Home Secretary regarding the Miners' Eight Hours Bill; and that Mr. J. T. Piper, the Accountant, who was indisposed, completed last January fifty years in the Company's service. The report (which recommended the payment of the statutory sliding-scale dividends) was adopted. The accounts for the half year to Dec. 31 showed a profit balance of £12,043.

Prospects of Reduced Price at Ilfracombe.

The accounts presented at the recent annual meeting of the Ilfracombe Gas Company showed that the revenue from the sale of gas last year was £8070, that residuals produced £1584, and that the total receipts amounted to £10,406. The expenditure on the manufacture of gas was £5712; on distribution, £731; and the total expenses were £7835. The balance carried to the net revenue account was £2571; and there was a sum of £4025 available for distribution. The Directors reported an increase of 1,739,000 cubic feet in the sales of gas during the year. The coal tenders which were made in 1906 at very satisfactory figures terminated in June last, and in consequence of the high prices ruling during the latter half of the year, the coal account showed an increase of £527 over the amount paid during 1906. The working results had, however, been satisfactory. The Chairman (Mr. R. Lake), in moving the adoption of the report, referred to the good position of the Company, and said that, with the present outlook, he trusted they were within reasonable distance of another reduction in the price of gas. The success achieved was due in great measure to the excellent management of Mr. J. Armstrong, the Manager, and the hearty co-operation of Mr. C. E. Ball, the Secretary. The report was adopted, and the statutory dividend of 5 per cent. declared.

Healthy Condition at Lichfield.

At the annual general meeting of the Lichfield Gas Company on Tuesday last, the Chairman (Alderman H. M. Morgan) remarked that, though the statement of accounts for 1907 did not appear so good on paper as the one for the previous year, the business of the Company was in quite as healthy a condition. The increased expenditure was, as usual, caused by the fact that coal had cost considerably more than in the preceding twelve months; and had it not been for the return obtained by the manufacture of sulphate of ammonia and a continued slight increase in the consumption of gas, the Directors would have had to resort to the inevitable expedient of raising the price, with the consequent reduction of the shareholders' dividends. This, he was glad to say, would now be deferred until the new coal contracts were entered upon next June. For the past half year they proposed to pay the usual dividends. What the ultimate results would be could hardly at the moment be determined, especially with the Mines (Eight Hours) Bill looming in the distance. The coal question was a very serious one for conductors of gas undertakings to consider; so much so, indeed, that the Directors had determined to prepare for all contingencies in regard to their winter coal supplies by having increased coal storage on land adjacent to the gas-works. The report and accounts having been adopted, the Chairman said it was his pleasurable duty to propose a

very sincere vote of thanks to the Manager (Mr. F. Key) and his staff, for the continued interest taken by them in the business. It seemed never to relax, but rather to increase year by year. The vote was heartily accorded, and Mr. Key expressed thanks on behalf of himself and the staff for the kind acknowledgment of their efforts to make the undertaking prosper.

Important Developments in the Uxbridge District.

At the recent annual meeting of the Uxbridge Gas Company, the Directors reported that the net profit for the year ending Dec. 31 last was £4639, and that £3913 was available for distribution. They therefore recommended the payment of a dividend (less income-tax) at the rate of 5 per cent. on the consolidated stock, which would absorb £3719, and leave £194 to be carried forward. It was pointed out that as, under the consolidation, the 9 per cent. dividend on the original shares was converted into 4½ per cent., or a doubled par value, the dividend recommended was 10s. per cent. above that payable under the consolidation, or £1 per cent. more than that hitherto paid on the old par value. It was explained that this highly satisfactory result had arisen through the sudden extension of the Company's sale of gas by 10½ per cent., owing to the rapid development of lighting in the additional districts acquired under the new Act, more especially near the new railway stations at Denham, Gerrard's Cross, and Beaconsfield. The Directors expressed their pleasure at reporting that the districts of Stanwell, Horton, Langley Marish, and Wyrardisbury had been opened to the Company, and that they had obtained the lighting of Colnbrook, by the acquisition of the gas-works at the last-named place by arbitration, under the terms of the Act; and that since the 1st of January last the mains in these districts had been filled from Uxbridge. They were further happy to report that terms had been arranged for taking over forthwith the lighting of the town of Beaconsfield and the acquisition of the works and mains of the Gas Company, which would give that Company a larger net income than they had hitherto received, and at the same time reduce the price of gas from 5s. to 3s. 9d. per 1000 cubic feet. This reduction, it was thought, was certain to extend the use of gas and further increase the profit. The Chairman (Mr. H. E. Jones), in moving the adoption of the report, remarked that not only had the Directors to pay last year something like 3s. 9d. per ton extra for coal, but were not allowed to stand still; for hardly had the ink become dry, so to speak, on their new Act of Parliament, before their Deputy-Chairman (Mr. Fassnidge) called his attention to the fact that they must move rapidly in the neighbourhood of Gerrard's Cross, for a great place was growing up, and an electric light company were proposing to do the lighting. This was a contingency they did not look forward to for many years to come; but in consequence of it they had to go on laying mains. There was one circumstance in connection with this district which they overlooked when framing their Act. There had recently been completed a new railway line between Beaconsfield and Denham, and within about half-a-mile of the Company's limits there were no less than 22 railway stations or lines that were more or less connected with London. The Directors were not prepared for so great a development, and they considered how far it would be necessary to raise the charge for gas on account of the high price of coals, and also because of the large expenditure they were incurring. Their Engineer (Mr. C. Hulme), however, reported to them an increase of 10½ per cent. in the consumption of gas in the new district. They therefore came to the conclusion that he had worked with great economy and judgment, and it ultimately turned out that they could give the shareholders the same dividend as before, and not raise the price of gas. The Chairman then dealt at length with the balance-sheet, comparing the figures with those of the previous year, and congratulating the shareholders on the large increase in the sale of gas. He added that since the figures had been got out, they had begun lighting Beaconsfield, where they now had 82 consumers; and they thought the people were getting a much better return than they had before the Company took over the business. The Beaconsfield people were getting their gas at the Uxbridge Company's price, instead of paying 5s. or 6s. per 1000 cubic feet, as they had done before. At Colnbrook, too, they had already some 50 consumers, and about 40 at Longford; and next year's accounts would include the income from these places. He mentioned that they paid £1800 for their Colnbrook possessions, and he believed business in this direction would largely increase. In conclusion, Mr. Jones announced that, owing to the increase in the duties of the office, the Secretary (Mr. W. M. Gardiner) had felt compelled, on account of his professional business, to resign. The report was adopted.

Water.

Void Houses and Slack Trade at Bristol.

At the annual general meeting of the Bristol Water Company, on the 7th inst., the Directors reported that the revenue from water-rates for the past year was £151,578; being an increase of £845 on that for the previous year. The net sum shown by the revenue account (including £3427 brought forward) to be applicable for dividend on the ordinary capital was £68,272. Out of this, an intermediate dividend at the rate of £7 15s. per cent. per annum on the ordinary shares and £5 8s. 6d. per cent. per annum on the 7 per cent. maximum consolidated ordinary stock was paid on the 5th of September—leaving an available balance of £36,295; and the Directors recommended the payment of final dividends at the respective rates of £8 per cent. per annum on the ordinary shares, and £5 12s. per cent. per annum on the ordinary stock of the Company, leaving £3239 to be carried forward. It was mentioned that the Bedminster Down reservoir was finished in March last year; and that the additional filter-beds at Barrow were ready for use—completing for several years to come the Company's equipment in this respect. The capital expended during the year was £20,731. The Engineer (Mr. J. A. M'Pherson) reported that the works were all in good condition. The Chairman (Mr. H. N. Abbot), in moving the adoption of the report, pointed out that the increase of revenue from water-rates last year was a disappointing one. In 1906, it was £1780; and they would have to go back to the years 1882 and 1894 for similar disappointing returns. They were, however, generally able, and particularly in the present case, to put their fingers upon the causes which led to the disappointment, and they could not for a moment suppose they were permanent. There had been a decrease of £1750 in the amount paid by the building trade for water, as compared with 1894. Owing to the wet season, there had been a reduction in the sum paid for street watering. At the present time there were nearly 5000 void houses in Bristol; and the loss in this connection was about £7300. The Company's connections numbered 76,000, when everything was in full swing; but owing to the voids there was a loss of 4½ per cent. Their means of supply were far in excess of the present requirements, and would be adequate to meet extensive city development. At present they sent 9 million gallons of water into Bristol daily, or 3300 million gallons yearly. After mentioning that the Directors had seen their way to increase the dividend by one-eighth, the Chairman discussed the expenditure, and said that last year was a good one for water-works generally because of the rainfall. It had enabled the Company to effect a substantial saving in working expenses; and on the coal bill there was a reduction of £861. In conclusion, he commented upon the fact that rates and taxes accounted for two-fifths of the Company's working expenses. The report was adopted and the dividends declared.

Increasing Prosperity at Leatherhead.

At the recent half-yearly meeting of the Leatherhead and District Water Company, the Directors reported a profit of £2468 on the past six months' working, and a sum of £3086 available for distribution; and they recommended dividends at the rates of 10 and 7 per cent. per annum. The payment of these would absorb £2068, and leave £1018 to be carried forward. The Engineer (Mr. F. Southwell Cripps, Assoc.M.Inst.C.E.) reported that the water supply had been satisfactory in both quantity and quality, and that the plant generally had been maintained in good order. Mr. W. B. Brown, who presided in the absence of the Chairman (Colonel A. C. Gleig), in moving the adoption of the report, said the quantity of water pumped during the past half year had been 97 million gallons—an advance of a million gallons on the quantity lifted in the corresponding half of 1906. The smallness of the increase was due to the showery weather experienced. It was interesting to note that in the latter half of 1907 they pumped 97 million gallons, bringing in a revenue of £4118; while in the corresponding period of 1902 they pumped 65 million gallons, bringing in £2752—an increase of about 50 per cent. in bulk and revenue in five years. This he considered was a very satisfactory state of affairs. The cost of fuel was higher, owing to the increase in the price of coal, to the extent of £57; but there had been a saving of about £90 in respect of the work on the mains and services, brought about by their having got nearly the whole of the mains laid at a sufficient depth to be secure from frost. Reporting on the quality of the water recently, Dr. Thresh stated that it was "of the highest degree of chemical purity, and well adapted for the purposes of a public supply." This was as good a report as they could have. In conclusion, he said it was satisfactory to learn that at the present time the Company were supplying 3049 houses, together with 183 separate meter supplies. Mr. A. Bird seconded the motion, and said in the past six years they had increased their output by 61 per cent. The report was adopted.

Continued Progress at Newcastle.

At the annual meeting of the Newcastle and Gateshead Water Company, the Directors presented the accounts for the year ended the 1st ult., and reported continued satisfactory progress in the revenue. The gross receipts amounted to £192,290, and the expenses (including working charges, management, and maintenance) to £43,656; leaving a balance of £148,634. Adding the amount brought forward (£2149), there was produced a total of £150,783, which the Directors recommended to be appropriated as follows: Interest on debenture stock, loans, &c., to Feb. 1 last, £30,637; interim dividends paid in August last, £56,782; final dividends (making £5, £7 17s. 6d., and £5 10s. 3d. for the year), £60,415. After payment of these sums, there would be a balance of £2949 to be carried forward. The Directors stated that the expenditure on capital account for the year, other than the cost for street and service-pipes to meet the demands of their new customers, amounted to £14,216. A portion of the Company's district at present being supplied by the Blaydon and Ryton Urban District Councils is included in the parliamentary area of the Company; but the water has hitherto been delivered to them in bulk. The Councils intimated to the Company that they were prepared to dispose of their interest in the works and pipes in order that the Company should supply in detail; and a satisfactory agreement has been arrived at for the purchase of the respective undertakings. The Councils cannot legally make the transfer without the authority of Parliament; and, as already recorded in the "JOURNAL," a Joint Bill has been promoted for this purpose. The Bill also seeks power to enable the Company, in the event of the agreements being confirmed by Parliament, to purchase two small pieces of land, and to acquire certain pipe easements, so as to be in a position to supply the higher portions of the districts in question. The Directors added that they thought it was desirable that the Company should, wherever practicable, supply the area allotted to them by Parliament. The report was adopted.

Cheaper Gas at Longton.—The Gas Committee reported to the Longton Town Council last Thursday week that they had received a communication from the Finance Committee asking what amount it was proposed to pay over in relief of the rates for the coming year. It was recommended by the Gas Committee that from the end of the current quarter the prices charged for gas for illuminating purposes (including public lighting), should be reduced 2d. per 1000 cubic feet; and that the amount to be paid over to the borough fund for the relief of rates should be increased from £2500 to £3000 for the ensuing year.

Gasholder Injured by a Gale.—During a gale last Wednesday one of the holders at the gas-works at Chudleigh, the property of the Devon Gas Association, Limited, was seriously damaged. The wind, which was blowing with tremendous force, snapped two supports, with the result that the holder was precipitated sideways into the pit. The occurrence took place just before half-past four. The holder has been in use about eight years, and the supports are of cast iron. There was a good quantity of gas in the holder at the time; and had the Association not possessed another the town would have been in darkness.

OPPOSITION TO THE GOVERNMENT COAL BILL.

In the "JOURNAL" last week, it was mentioned that a meeting had been called for this afternoon, at the Cannon Street Hotel, to record a protest against the Mines (Eight Hours) Bill which has been introduced by the Government, and that it was hoped steps would be taken to convene other meetings with the same object in different parts of the country. Information in connection with such meetings was invited by Mr. G. E. Raine, who is organizing them on behalf of the Coal Consumers' Defence League; and we have received from him several leaflets which will be found most helpful by all desirous of joining in the fight against dear coal. That it will certainly be dearer if the Bill is allowed to pass is shown by the action of the Lancashire coal owners last Wednesday, when they met to consider the price to be inserted in gas-coal contracts under renewal. They decided to quote the former figures provisionally, but to insert a clause providing for an addition of 1s. 6d. per ton if the Bill becomes law. Mr. Raine, in some pithy yet forcible sentences, shows how the consumer and the investor alike will be prejudicially affected by the proposed legislation; and he urges both to bestir themselves in opposition to a measure which will give a million men and boys their present pay for less work, to the detriment of 43 million people who have to depend upon their labour. The above-named League have prepared two petitions—one to be presented to each House—and are taking active steps to obtain signatures to them. The text of one of the petitions is as follows:—

Petition against the Dear Coal Bill.

1.—That the Coal Mines (Eight Hours) Bill (No. 2), now before Parliament, would, if passed into law, result in an immediate reduction of output, with an immediate advance in the price of coal, as stated in the "Summary of Conclusions" of the final report of the Departmental Committee appointed by Mr. Home Secretary Gladstone last year to inquire into the probable economic effect of a limit of eight hours to the working day of coal miners.

2.—That the increased cost would be a grievous burden on private and industrial consumers, and would further increase the price of gas and electric light and power, and would add to the purchase price of the necessities of life and of all commodities in the manufacture of which coal is employed.

3.—That the margin between supply and demand in coal is very small, and that a shortage in supply has invariably in the past been attended with an immediate rise in price, followed by grave results upon the general industries of the country, by loss of employment to thousands of workers, and by hardship and suffering to the poor.

4.—That the miners are only a fractional portion of the population of the country; and that, seeing that the Departmental Committee aforesaid came expressly to the conclusion that the health and physique of the coal miners at the present time compare favourably with that of any other class of workpeople, your petitioners humbly claim that the many should not be sacrificed by the Parliament of the whole nation in order to satisfy the unjustifiable and sectional demand of the few.

The Plymouth Chamber of Commerce Oppose the Bill.

Sir Joseph Bellamy, the Chairman of the Plymouth and Stonehouse Gas Company, brought the subject of the Bill before the attention of the Port of Plymouth Chamber of Commerce last Tuesday, and moved a resolution requesting the Members for Plymouth and Devonport to oppose it, "in view of the very probable injurious effect it would have upon the industries of the country depending on cheap coal supplies, as well as upon private consumers of coal and gas. Sir Joseph pointed out that as the Gas Company work under a sliding-scale, both gas consumers and shareholders are affected by an increase in the price of gas. From figures put before him and his colleagues on the Board of the Company, they believed the effect of the Bill would be equivalent to an increase of 2d. in the pound in the rates of Plymouth—for the ratepayers were practically all gas consumers. This was a very serious thing, and a commercial body like that Chamber ought not to hesitate to express their opinion upon it. Mr. Wade, who seconded the motion, said there could be no doubt that the immediate effect of the passing of the Bill would be an increase of 1s. 6d. per ton in the cost of coal, and this would continue until a sufficient number of men were drawn into the mines to enable them to work double shifts. The resolution was carried with one dissentient.

The "Iron and Coal Trades Review" on the Bill.

The following editorial article dealing with the Bill appeared in the "Iron and Coal Trades Review" last Friday.

In the course of his reply to one of the deputations which waited upon him last week with respect to the Eight Hours Bill, Mr. Gladstone said that the "Government had no intention of passing any Bill with their eyes open which would have a mischievous effect upon the industries of the country." We have contended all along that the question of a legally enacted eight-hours day for miners has been permitted to come within the range of practical politics through misconception of the conditions of the mining industry, and through lack of knowledge of the dangers involved. As we have previously pointed out, this is a measure which only needs to be understood in order to be defeated. The Bill is based upon fallacies. If these fallacies can be cleared up in time, the dangers will be averted. It is evident that Mr. Gladstone, the Minister in charge of the Bill, is becoming more and more cognizant of the evil results likely to follow the adoption of the measure; and we venture to express the opinion that it is not yet too late to defeat the proposal.

We do not seriously blame the Government for adopting the Bill, any more than we blame public opinion for passively acquiescing (under misapprehension) in the measure being brought so far forward. But we do blame those who, knowing the real meaning of the project, have failed to make known to Parliament and the public the serious nature of the issues involved. While the miners' leaders have been constantly agitating for this measure, and imposing upon what we may term the humanitarianism of the public, there has been little or no counter-agitation in the interest of the nation's industries. Public sympathy has been exploited on behalf of the coal-getter to an extent altogether inconsistent with the facts of the case. But the commonweal must not be sacrificed to faction without protest. The facts must be made known, and the fallacies cleared up, before it is too late.

We seriously suggest that the Bill ought to be dropped; and we feel confident, from Mr. Gladstone's recent speeches on the measure, that the Government have some grave misgivings as to the wisdom of their action in standing sponsors for it—misgivings which are becoming more and more pronounced as their eyes are being opened to the probable "mischievous effect upon the industries of the country," to quote the Home Secretary. We welcome Mr. Gladstone's declaration on behalf of the Government that they will "most favourably consider" any suggestion "to avert a real and serious injury to the industries of the country," and that they have "no intention of passing any Bill which would have a mischievous effect."

The Bill, if it becomes an Act, will have many mischievous effects. It will do much harm and no good. There is no justification for the measure. It has gained Government and public support under false pretences; and now that the facts are being gradually brought to light, the Bill ought, in the interests of the nation, to be abandoned. The advocates of the measure have no case that will bear the test of scrutiny. The Bill is not designed to remedy any substantial grievance. It is an hour-of-labour Bill applied to an industry in which the hours of labour are exceptionally short already. It is a Bill that will inflict hardships upon the very labour which it is intended to benefit. It will make our mines much more dangerous; it will force up the price of coal, and impose a tax upon every householder and every industry; and, by handicapping our manufacturing trades, will aggravate the unemployed problem.

So far from the Bill being justified on "humanitarian" grounds, these are the very strongest grounds upon which it may be condemned. The measure would mean loss of employment to those miners now working in thin and costly seams; it would inflict hardships upon the elderly and delicate men, just as the Workmen's Compensation Act has done; and, through the efforts to speed-up, accidents would certainly increase. Therefore the passage of the Bill would be a grave blunder from the humanitarian as well as from the commercial point of view. The measure would prove costly in life and limb, as well as in pounds, shillings, and pence.

The following article, containing some merchants' opinions on the subject of coal prices, as affected by the Eight Hours Bill, appeared in the "Westminster Gazette" last Saturday.

Apart from the ordinary transactions of business on the Coal Exchange yesterday, nothing was more discussed than the desperate attempt the colliery owners are making to increase the price of coal 1s. 6d. per ton should the Eight Hours Bill become law. Two important private meetings have already been held in London with this object in view. One of these meetings concerned the gas coal trade only; and at this a resolution, passed at the earlier meeting of the Gas Coal Federation, was considered. The main feature of this resolution was an advance in prices of 2s. 6d. per ton over those of 1906. This alone would naturally, if adopted, mean an increase to the householder in the price of gas. After much discussion, it was next proposed that a clause be inserted in all contracts stipulating that the buyer shall pay an increase of 1s. 6d. per ton should the Eight Hours Bill become law. The meeting, however, was not unanimous, even on this; and the further consideration of the question was adjourned until the 20th inst.

At a second meeting, the question of house coal contracts was considered. At this gathering a large and representative number of colliery owners, merchants, and agents were present, and Mr. Maurice Deacon, of the Sheepbridge Coal and Iron Company, presided. Here a resolution was carried to insert a clause in all future contracts that, should the Eight Hours Bill become law, an advance of 1s. 6d. per ton should take place. But this resolution must be confirmed at a meeting that will in all probability take place next [this] week.

The opinion among many merchants was that not only was such an advance in prices absurd, but that it was in no way justified. "It is not business," said one merchant to a "Westminster" representative, "to insert such a clause; and I do not believe it will be inserted, whatever may be eventually resolved upon among colliery proprietors. And if any do insert it, there will be a previous understanding that it shall have no effect."

"All I can say is" remarked another, "that I will not buy where any such uncommercial condition is made. When you place a contract you place it, for 10,000 or 100,000 tons. What have we, as business men, to do with a matter which some coal owners are trying to turn to political account? Does your tailor make a condition that you should pay an extra price for a suit of clothes if cloth should go up or if something happened which might have the effect of sending it up? The whole thing is childish."

"But a Miners' Eight Hours Bill," said another, "could never cause an increased cost of 1s. 6d. per ton to the colliery owner. The miners work so irregularly that it would simply mean that, instead of working five days a week for, roughly, ten hours per day, they would have to work six or eight hours. And why should they not? Thus the only extra cost to the proprietor would be the winding of the men up and down the shaft, and matters of that sort. It might make a small increase in cost of output, but not anything like 1s. 6d. per ton."

The Opposition to the Gosport Gas Bill.—The opposition to the Gosport Gas Bill in the House of Commons has thrown upon the Sanitary Authority of the district a charge of £700, which is £300 more than the estimate, and is equal to a rate of 1½d. in the pound. At their meeting on Thursday, however, the members expressed an opinion that the valuable concessions obtained in the future charges for gas were quite worth this heavy expenditure.

EXTENSIONS AT SOUTHPORT.

At the Monthly Meeting of the Southport Town Council last Tuesday, the Gas Committee were empowered to accept tenders for the raising of the roof, stage flooring, and building of new benches in the retort-house, at an estimated cost of £7180.

Alderman Travis, the Chairman of the Committee, explained that a little while ago they raised the roof of a portion of the retort-house and put in new retorts, and the present proposal referred to the completion of the arrangement. When the new benches were put in, there would be room for further extensions later. In the past two years they had built additional retorts and put in new ones in place of the old existing ones, at a cost of over £20,000; and the retort-house extensions, when finished, would have cost them £30,000 in round figures. This seemed a large sum of money; but it paid to spend it. If it had not been for this expenditure, with the rise in the price of coal during the past year, one of two things must have happened. They would have had to raise the price of gas, or they would not have been able to have a profit of £13,000, which he expected would be handed over again at the end of the financial year in relief of the rates. It was intended to pay for the alterations out of the revenue, not of one year, but of two. This was the unanimous decision of the Committee. The difference between having the new retorts and making carburetted water gas would amount to about £800; so they had 10 per cent. of the money there. He hoped that when these extra expenses were met from the revenue, they would be able to reduce the price of gas. At all events, there could be no reduction in the price if they used the old methods, which were now out of date and unprofitable.

It was resolved to get the sanction of the Local Government Board to the borrowing of £5000 for gas-cookers; this sum being the balance of an amount authorized under their Provisional Order of 1905.

Alluding to the extensions, Alderman Griffiths said the Corporation were most fortunate in having an excellent Engineer (Mr. John Bond); and it ought not to be forgotten that, in carrying out all these improvements, they had not had to put up a single building. The old Gas Committee of 25 or 30 years ago made sufficient provision in this respect. They had had to pull down one small part; but with this exception, all the bricks and mortar put up a quarter-of-a-century ago stood, and were in use, at the present moment.

A DUBLIN ALDERMAN ON GAS PRICES.

At the Meeting of the Dublin Corporation on Monday last week, Alderman Vance moved—"That a petition be made by the Corporation and two gas ratepayers to the Court of Quarter Session to nominate and appoint some public accountant or other competent person, not being a proprietor, to examine and ascertain the actual state and property of the Alliance and Dublin Consumers' Gas Company, and report to the said Court if a rateable reduction in the price of gas can be made." The Town Clerk allowed the Alderman to make a statement in introducing the resolution, and then pointed out that the motion was out of order. The Alderman replied that he had given his facts, and hoped the matter would be taken into consideration by the citizens. The citizens had no control over the Gas Company; but he thought there ought to be some way out of the difficulty.

In the course of his speech in support of his motion, Alderman Vance remarked that the overburdened ratepayers of Dublin had every reason to complain of the excessive charges that were made for the supply to them of gas in the old city, and also in the added areas, as compared with other places, not only in that country, but in the sister island. He would like to direct the attention of the Council to the condition of matters in the city of Belfast. Since the Belfast Corporation took over the gas-works in 1874, the Gas Committee had handed over to various departments of the Corporation the sum of £226,952. This was within measurable distance of a quarter-of-a-million of money that, owing to the business capacity of the commercial capital of the country, had been handed over to the relief of the rates and other things in connection with Belfast. This showed the wisdom of those who took part in the work. They were a standing memorial to capacity. Going from Belfast to other towns, he said not one of the places he would mention showed the lamentable condition of things that existed in their own midst. The populations were remarkably well catered for. The very poorest of the people were able to buy gas and to have their houses well supplied. In Nottingham, the consumers paid 2s. 6d. to 2s. 2d. per 1000 cubic feet; in Leicester, 2s. 4d.; in Belfast, 2s. 3d. down to the low sum of 1s. 11d.; in Salford, 2s. 7d. to 2s. 3d.; in Oldham, 2s. to 2s. 3d.; in Bolton, 2s. 6d. to 3s.; in Halifax, 2s. 3d.; in Birkenhead, 2s. 6d.; in Huddersfield. 2s. 6d.; in Blackburn, 3s. 3d.; in Burnley, 2s. 6d.; in Rochdale, 2s. 8d.; in Blackpool, 2s. 4d.; in Southport, 2s. 6d. to 2s. 8d.; in Walsall, 2s. 6d. to 2s. 3d.; and in Wigan, 2s. 10d. Now take, he said, the gas undertakings controlled by private companies. In Bath the price was from 2s. to 2s. 1d.; in Bristol, 2s.; in Plymouth, the very low sum of 1s. 9d.; in Sheffield, 1s., 1s. 2d., and 1s. 4d. Let them compare these figures with those which existed in Dublin. The Dublin prices were 3s. 7d., 3s. 10d., and 4s. 6d. respectively. This was enough to convince any person of the absolute necessity of making some inquiry into the condition of matters in Dublin. Now leaving these private companies and coming to corporations, they found that in Birmingham the price was 1s. 10d. per 1000 cubic feet; in Bradford, 2s. 1d.; in Nottingham, 2s. 2d.; and so on. He knew no reason why gas in Dublin should be so dear. It might be due to the fact—he did not know whether it was a fact or not—that the Gas Company was over-capitalized, or to some other reason. Certainly it was the duty of the Corporation to see if they could possibly manage that the great population of Dublin should be supplied with gas at a reasonable figure. A large number of the people of Dublin could not afford to pay the price demanded. He respectfully said it was the duty of the Corporation to make some inquiry to ascertain if anything could be done by which the great bulk of the community might be able to take advantage of the gas supply.

METROPOLITAN WATER BOARD.

Capital Expenditure—Charge for Water for Horses, Carriages, &c.

At the Meeting of the Metropolitan Water Board on the 28th ult.—Sir Melvill Beachcroft in the chair—the Finance Committee reported that the total expenditure on capital cash accounts during the three years and six months between the appointed days and Dec. 31 last amounted to £2,999,463, of which £2,876,140 had been raised; leaving a deficiency on the aggregate account of £123,323, made up as follows: (1) Capital accounts overdrawn (*i.e.*, expenditure in respect of which no borrowing has been made), £568,400; (2) capital accounts showing a balance in hand, £445,077. The Appeal and Assessment Committee recommended—"That the following scale be adopted for horses, carriages, and automobiles: (1) When the supply is not taken by meter, the following annual charges to be made: Horses (private), 5s. each; do. (trade), 4s.; carriages (private, two wheels), 5s.; do. (four wheels), 10s.; carriages used for trade (two wheels), 2s. 6d.; do. (four wheels), 5s.; motors (private), 10s.; do. (trade), dependent upon horse power, &c. (2) Where more than five horses are kept, or the aggregate charges under the above scale will exceed £1 2s. 11d. per quarter, the supply to be taken by meter under section 16 of the Metropolitan Water Board (Charges) Act, 1907." Lord Welby, on behalf of the Finance Committee, moved, as an amendment, that the charge for a supply of water to horses for private purposes should be 8s. each per annum, and for trade purposes 6s. each per annum; and that the charge of 10s. for the supply of water to an automobile should be increased to 20s. per annum. After some discussion, the amendments were adopted.

Statistical returns, in the usual form, relating to the supply of water in December and January, were submitted. The figures for the month of December last were: Average daily supply, 204,203,000 gallons; number of houses, &c., supplied, 1,073,432; estimated population, 6,961,669; mean supply per head per day, 29·3 gallons, compared with 30·4 gallons in December, 1906; water in store, 5826 million gallons; number of additional supplies laid on (including trade), 745; and length of mains laid, 5451 yards. The figures for January were: Average daily supply, 225,344,000 gallons; number of houses, &c., supplied, 1,074,002; estimated population, 6,965,069; mean supply per head per day, 32·3 gallons, against 31·7 gallons in January, 1907; water in store, 6698 million gallons; number of additional supplies laid on (including trade), 676; and length of mains laid, 7033 yards.

The Staines Reservoirs Communication Works.

At the Meeting of the Board last Friday, the Finance Committee submitted an estimate of £149,773 on account of capital expenditure proposed by the Works and Stores Committee to be incurred during the period between the 31st inst. and the passing of the annual estimates. The estimate included £68,398 for reservoirs and aqueducts, £1260 for wells, £17,600 for filter-beds, £12,180 for machinery, lathes, tools, and plant, £12,150 for buildings, £1535 for fencing, £33,550 for extensions of mains and pipes, and £3100 for meters and fittings. At their next meeting, the Board will be asked to approve the estimate. The Works and Stores Committee presented a report in regard to the Staines reservoirs communication works (New River district), and stated that they had received a report from the Chief Engineer (Mr. W. B. Bryan, M.Inst.C.E.) dealing with the total cost of the works, from which it appeared that it would be necessary for the Board to authorize expenditure of £70,368 in excess of the estimate of £152,400 already sanctioned, to enable the works to be completed. The total cost of the works would be £1,214,392. The total amount provided in the New River Company's Act of 1897, under which the works were being constructed, was £1,000,000; but the Company's Engineer (Mr. J. Francis) stated before the Court of Arbitration that the probable cost of the whole of the works would be £1,270,000. The difference between the Company's estimate and the Board's figure was due to the fact that certain modifications had been made in the details of the scheme as sanctioned by Parliament. The Committee recommended that the estimate of £70,368 should be approved; but, in view of the fact that the recommendation involved an expenditure exceeding £5000, consideration of it was, in accordance with Standing Orders, adjourned for a fortnight. The Works and Stores Committee also reported that they had accepted the tender of Messrs. J. Moran and Son, Limited, of £52,564 for the completion of the construction of filter-beds, &c., at Long Ditton; the contract with Messrs. Pethick Bros. for the construction of the works having been determined.

WATER SUPPLY FOR FIRES IN LONDON.

The Provision of Adequate Mains.

At a recent Meeting of the London County Council, the Fire Brigade Committee presented the following report on the above subject.

We have from time to time drawn the attention of the Council to localities in which the supply of water is inadequate for fire purposes; and for some time past we have been in communication with the Metropolitan Water Board with a view to the Board laying down larger mains so as to ensure a proper supply of water being available in case of fire. A conference on the subject took place, at the request of the Board, on Feb. 28, 1905, when the Chairman of the Fire Brigade Committee (Mr. Edward Smith) and the Chief Officer of the Brigade (Captain J. de Courcy Hamilton, R.N.) represented the Council. After the conference, a list was sent to the Board of certain important cases of main extensions, connections, or improvements which ought to be carried out for the purpose of increasing water supplies for fire purposes. This list was not a complete one of all cases in which inadequate water supply for fire purposes existed, and other cases have since been, and no doubt more will be, brought to the Council's notice. The Board, in a letter dated Oct. 30, 1906, stated that they had given the whole subject their most careful consideration; and that, while desirous of assisting the Fire Brigade in any manner possible, they were not prepared to pay

the cost of main extensions, connections, or improvements which the Council might consider necessary for fire purposes, but were willing to carry out any such work at the Council's cost, provided that where any extension would effect a reasonable improvement in the ordinary supply, the Board would be prepared to share the cost with the Council in proportions to be agreed in each case. The Board estimated at £6597 the cost of the work mentioned in the list sent; and of this they were prepared to pay £800.

Before any decision was arrived at on the Board's letter, another letter, dated March 13, 1907, was received from the Board, suggesting that a further conference should be held on the whole question. This took place on July 18, 1907; the Hon. Rupert Guinness, C.M.G., and Mr. F. S. Hanson representing the Council, and Sir R. Melvill Beachcroft and Mr. E. B. Barnard, M.P., the Metropolitan Water Board. The Board's representatives did not hold out any hope of the Board materially altering their proposals; but a suggestion was made that it might be possible for the payment by the Council of their proportion of the expenditure to be spread over a term of years. Upon further consideration of the whole question, we informed the Board that we were not prepared to recommend the Council to pay the cost of main extensions, connections, or improvements considered necessary for fire purposes, as we were of opinion that the Board, as the water authority, should provide adequate water supplies for all purposes, and that the Board and not the Council would be held responsible in the event of any damage or loss of life occurring as the result of a short supply of water at a fire. The Board have now asked the Council to join with them in submitting to arbitration the question in dispute—viz., as to the allocation of the cost of the works comprised in the schedule submitted by the Council—and have decided that, subject to the Council consenting to such arbitration, the works shall be taken in hand by the Board forthwith.

The provision of an adequate supply of water for fire purposes is a matter of great importance, and we think that the suggestion of the Board should be agreed to. Pending the Arbitrator's award, it is not possible to estimate the liability (if any) which will devolve upon the Council, or the proportion which will come into charge in the ensuing financial year, particularly if the suggestion of the Board be adopted that the payment by the Council of their proportion of the expenditure might be spread over a term of years. The Finance Committee therefore suggest that provision be made in the draft estimates for 1908-9, under the head of "Provision Moneys," in respect of the expenditure which may have to be incurred. We recommend—"That the suggestion of the Metropolitan Water Board to submit to arbitration the question of the allocation of the cost of certain water-main extensions, connections, or improvements considered necessary by the Council for the purpose of affording an adequate supply of water in case of fire, be agreed to." The report was adopted without debate.

TYNEMOUTH WATER SUPPLY.

Approaching Completion of the Font Scheme.

For several years past the Tynemouth Corporation have been supplementing the existing water supply to the extent of from 200 to 300 million gallons a year, drawn from the Newcastle and Gateshead Water Company's reservoirs. About ten years ago, however, parliamentary sanction was obtained for carrying out a comprehensive scheme of water supply, by means of which it will be possible, without drawing on outside sources, to serve the area with a quantity of water varying from 2½ to 3 million gallons a day. This scheme, which has involved an outlay of about £520,000, and is now nearing completion, included the construction of a storage reservoir situated in the valley of the Font, 25 miles north-west of Tynemouth, and a gravitation main consisting of two lines of 18-inch pipes leading therefrom to a new covered service reservoir at Moorhouses, two miles from the borough. A few days ago, news was received in North Shields to the effect that water was rising in the Font reservoir, and was being sent on to Tynemouth at the rate of 60,000 gallons an hour; and subsequently a message was received to the effect that the quantity had been increased to 130,000 gallons, which is nearly the full capacity of the pipe which has been completed. The scheme provided for eight filter-beds; but only five have been constructed. The Act authorizing the construction of the works was passed in 1838, and ten years were allowed for their completion. It is expected that in some three months everything about the works will be finished. At the last meeting of the Tynemouth Town Council, Alderman Spencer, Chairman of the Water Committee, stated that it would probably require all next winter to fill the reservoir; but the work having fortunately been finished just in time to catch the present flood waters, the probability was that the close of the past week would see the great reservoir, 87 acres in extent, filled, and its 720 million gallons of water in store, which would represent a six months' supply without rain.

HULL CORPORATION WATER SUPPLY.

Mr. F. J. Bancroft's Annual Report.

The Water and Gas Engineer of the Hull Corporation (Mr. F. J. Bancroft, B.Sc., M.Inst.C.E.) has lately issued his eleventh annual report on the water supply to the city. He points out that the rainfall at Pearson Park during the past year was 24·82 inches, or 2·2 inches below the average, which is 27·02 inches. The rainfall on the Wolds—the gathering-ground for Hull—was 26·17 inches, which is exactly the average for the previous 25 years. Of the total quantity of water drawn from the wells, 1,896,983,000 gallons came from Springhead and 1,792,508,000 gallons from Cottingham; making a total of 3,689,491,000 gallons. The greatest quantity sent out from each pumping-station in one day last year was: Springhead, 6,600,000 gallons, on July 17; and Cottingham, 6,106,000 gallons, on Dec. 30. The area of the district within which the Corporation are authorized to supply water was the same as in the previous year—viz., 16,377 acres, or 25·59 square miles. In addition, the Corporation sell water in bulk to the Cottingham Urban District Council for their district, and to the Sculcoates Rural District Council for the Sutton district. The estimated average population supplied within the water limits was: Within the boundary, 266,700; beyond it, 5300—total, 272,000. An extension of the adits at Cottingham was decided upon in June, 1905, and the work was commenced in August. The contract time for completing the adits, shafts, and bores was 20 months; and on the 29th of July last the Water Committee paid a visit of inspection. The Mayor turned the valves commanding the adits, and admitted the additional water obtained from the extensions. In the course of the year, 42,719 feet, or 8·09 miles, of new mains were laid and 155 fire hydrants fixed; but as 19,515 feet were taken up and disused, there was a net increase of 23,204 feet, or 4·4 miles. The total length of mains on Dec. 31 last was 254·23 miles. The past year was the first in which the consumers used (and Mr. Bancroft adds "misused") a daily average throughout the twelve months of 10 million gallons. The water sold by measure showed an increase of 39 million gallons; the total for the year being 848 million gallons, or nearly 2¾ million gallons per day. The domestic and unmetered supply amounted to a daily average of 7,709,000 gallons, or 28⅓ gallons per head per day. This was an increase upon 1906 of 428,000 gallons per day, or slightly more than one gallon per head per day.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

This is the season of the year at which the Edinburgh and Leith Gas Commissioners fix the prices at which they will supply gas to the two Corporations for public lighting. The prices for private lighting are settled in September. This week the Works Committee have had the subject under consideration; and they have resolved to recommend that the prices be increased. At the present time the charges are: For use with flat-flame burners (on stairs) 2s. 5d. per 1000 cubic feet, and for use with incandescent burners in the streets 2s. The recommendation is that these prices be increased to 2s. 8d. and 2s. 6d. respectively. For the guidance of the Committee, the Engineer—Mr. W. R. Herring—submitted a report to them, in which he stated that in 1904-5 the Gas Commissioners made a special rate to encourage the transformation of the public lamps into incandescent burners; and since then the rate charged for incandescent burners had been 2s. per 1000 cubic feet. Recently the Corporation of Edinburgh had introduced the practice of extinguishing half of the gas-lamps at about midnight; and during the summer months it was intended to light only about half of the lamps. The control of the consumption in the incandescent gas-lamps depended upon the pressure of the supply; and the consumption of all the lamps was greater per hour during the high-pressure lighting period up till midnight, and lesser from midnight till dawn. The city therefore were getting the advantage of their lamps burning a greater quantity of gas than they were rated for during the lighting hours; and the Commissioners were losing the advantage which they should obtain during the early hours of the morning. The extinguishing of the lamps at midnight involved the Commissioners in a consumption longer than the scheduled time. In consequence of the midnight beat for extinguishing, extra supervision was now required. For some time past gas has been supplied for public lighting purposes at less than the actual cost to the Commissioners. The rate charged was sufficient to cover manufacturing costs, and interest on money borrowed. The Commissioners had given the Lighting Department every possible encouragement and advantage in any extraneous items that might arise; but he was afraid the practice had been carried farther than justice to the ordinary gas consumer warranted. Furthermore, the exclusion of gas from the central area, and the extension of the burgh boundaries into the country side, involved the Commissioners in heavy expense for main-pipes, where no other gas consumption was demanded; and while the Commissioners were entitled to charge for this, it had been agreed between the departments that the price of gas should also cover the outlay. He had made a careful estimate of what the cost to the Commissioners would be during the ensuing year. Including capital charges, interest, and sinking fund contributions, it would amount to nearly 3s. 0½d. per 1000 cubic feet. The private lighting rate at present was 3s. A public lamp burning all night was equivalent to the consumption of a small consumer. The Commissioners were at no expense in connection with the fitting-up of a public lamp, nor in the repair and maintenance of these fittings; whereas in the case of a small consumer they had to bear the capital charges of laying the service-pipe, supplying the meter, and of repairing and maintaining the same. In the matter of collection, there was nearly as much trouble in keeping the accounts and reading the meter for the one small consumer as there was in dealing with the whole of the public lamps. Under the circumstances, the Commissioners could afford to supply the Public Lighting Department with gas at from 2d. to 3d. per 1000 cubic feet less than they charged ordinary consumers. Taking the price to the private consumer at the present figure—3s.—this rate, if adopted by the Commissioners, would mean that the charge for public lighting purposes should be fixed at 2s. 9d. or 2s. 10d. per 1000 cubic feet. The Commissioners had under consideration three proposals—one to fix the price of gas for incandescent public lighting at 2s. 9d., another at 2s. 6d., and a third at 2s. 4d. By a majority, the 2s. 6d. rate was adopted, and it will be recommended to the Commissioners at their meeting on Monday first.

The Western Juniors had a heavy night to-night, having had two papers before them. The first one, on "Producer Gas," by Mr. F. Mellor, who has charge of the producer plant in the engineering works of Messrs. William Beardmore and Co., at Parkhead, Glasgow, was a very exhaustive treatise upon the subject. The writer described the working and the results obtained in a large number of producers; showing the effects of the changes which were made in the evolution of the producer. It was a very long paper, and did not leave much time for discussion. It is doubtful, however, if the members would, in any

event, have said much upon the communication, as very few of them have had experience with gas-producer plant. Mr. E. M. Stewart, of Bonnybridge, re-read the paper he contributed to the Association a little over a year ago, upon "Fire-Bricks and Retorts." Although only a re-reading, the paper was greatly appreciated. It came before the Association again this evening on account of there not having been time to discuss it when it was first read; and Mr. Stewart thought it advisable to give it again for the benefit of those who had not heard it before.

A plumber named Marshall, in the employment of the Kirkcaldy Gas-light Company, Limited, was injured by an explosion of gas in Church Street, Pathhead, on Wednesday. In searching for a leak of gas, he bored the ground, and then applied a lighted match. The explosion which followed tore up the street for a considerable distance, and the man was severely burned. It is supposed that there had been an accumulation of gas in an old conduit.

The Selkirk Town Council held their monthly meeting on Monday evening, and Provost Sim moved a resolution to the effect that the Directors of the Gas Company be informed that the Council had recommended to the ratepayers the offer of the Company, but that the ratepayers had rejected it; that the Directors be further informed that a section of the ratepayers had understood the expression "at this stage," in the letter from the Company, to be an intimation that, in the event of the Company's offer being rejected, the Directors were prepared to enter into an agreement for a restricted dividend; and that the Directors be asked if that were correct, and, if so, to put in writing any agreement which they might suggest. The Provost said he regretted the result of the poll. They had three courses before them—to acquire by agreement, to come to an agreement for a restricted dividend, or to fight the Company. The Council adopted acquisition by agreement, but had been defeated upon it. They were now driven to the second course—to try to get an agreement for a restricted dividend. The resolution was adopted.

The Stonehouse Gas Company have reduced the price of gas from 4s. 7d. to 4s. 2d. per 1000 cubic feet. The latter was the price till last year, when it was necessary to raise it, owing to dear coal.

The proposal to construct a railway siding into the Hamilton Corporation Gas-Works has all along been bitterly opposed by a section of the Town Council. At a meeting of the Council on Tuesday, Bailie Cassells maintained that the resolution required the Gas Committee to report the result of their negotiations for approval, and wished to move an amendment. Provost Pollock said the resolution was to report only; the Committee having powers. He ruled it incompetent to move an amendment. Bailie Cassells and another entered their protest against the ruling. Baffled within the Town Council, the opposition are now preparing, outside the Council, a petition to the Board of Trade to institute an inquiry into the scheme.

I mentioned a week or two ago that the inhabitants of Limekilns and Charlestown had petitioned the Corporation of Dunfermline for a supply of gas. The Corporation on Monday had before them a report by their Engineer—Mr. A. Waddell—on the cost of supplying gas upon a high-pressure system. Including the laying of a 4-inch main to Limekilns, a distance of 4583 yards, and of a 3 inch main from Limekilns to Charlestown, a distance of 1577 yards, and the provision of a compressor and governors, the estimate of the Engineer was £2490. Interest and sinking fund upon that sum, at 10 per cent., would amount to £249. He estimated that in the second year's working the consumption of gas would yield a return of £252; leaving a profit of £3. The Gas Committee recommended that the estimate be adopted, and the work proceeded with. This was approved by the Council.

The Corporation of Newmilns, in Ayrshire, are about to introduce sulphate of ammonia manufacture into their gas-works. They have let the contract for the erection of the plant to the Chemical Engineering Company, at the price of £315.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia. LIVERPOOL, *March* 14.

Throughout the week there has been a good export demand, and production has been absorbed as it has become available at hardening prices at all points. There has also been more demand for home consumption; and this has had its effect upon the market. The closing quotations are consequently £12 per ton f.o.b. Hull; £12 2s. 6d. to £12 3s. 9d. per ton f.o.b. Liverpool; and £12 5s. per ton f.o.b. Leith. There has been increased interest in the forward position also, and a good business has been done at £12 2s. 6d. per ton, Leith and other ports, April-December and July-December delivery. At the close, an advance of 2s. 6d. per ton is asked, but so far buyers do not seem inclined to pay the premium.

Nitrate of Soda.

This article is quiet but steady, and the spot prices remain 11s. 1⅛d. and 11s. 4⅛d. per cwt. for 95 per cent. and refined qualities respectively. Forward delivery does not attract attention.

Tar Products. LONDON, *March* 16.

Markets for tar products are practically unchanged all round. Pitch is steady. Business continues to be done on the east coast for delivery to the end of June at 19s. 6d., but only for small quantities. The principal manufacturers appear to have disposed of whatever quantity they require to sell for this season's delivery; while for next season's though it is reported that very low figures are being accepted on the Continent, manufacturers on this side appear to prefer to wait the course of events. Creosote is easy. Business has been done in London for prompt delivery at 2⅛d. per gallon; while for forward, 2⅛d. to 2⅜d. is quoted. In the Midlands, oil is fairly steady; but in the North, low figures are said to have been taken for prompt clearance. Benzols are quiet at previous figures. In toluol, sales are reported in the

"VOLCANIC" (Powder). "VOLCUM" (Paste).

Andrew Stephenson,

Tel. Address:
"VOLCANISM, LONDON."

182, Palmerston House,
Old Broad Street,
LONDON, E.C.

LEST YE FORGET.

North at 8⅛d. per gallon, and in London at 9¼d. Solvent naphtha is quiet. Business has been done in London at 10¼d. Carbolic acid is steady. Business is reported in London at 1s. 7½d. and on the east coast at 1s. 6⅝d. There is a good demand for refined naphthalene; and creosote salts are easier in tone.

The average values during the week were: Tar, 12s. 6d. to 16s. 6d. *ex* works. Pitch, London, 20s. 6d. to 21s.; east coast, 19s. 6d. to 19s. 9d.; west coast, 18s. 9d to 19s. 9d. f.a.s. Benzol, 90 per cent., casks included, London 8½d. to 8⅝d., North 8d.; 50-90 per cent., casks included, London 8¼d. to 8⅜d., North 8d. Toluol, casks included, London 9¼d., North 8⅝d. Crude naphtha, in bulk, London 3¼d. to 4d., North 3¼d. to 3⅝d.; solvent naphtha, casks included, London 10d. to 10¼d., North 9d. to 9½d.; heavy naphtha, casks included, London 11d. to 11⅛d., North 10d. to 10½d. Creosote, in bulk, London 2⅛d. to 2⅜d.; North 2⅛d. to 2⅜d. Heavy oils, in bulk, 2⅜d. to 2⅝d. Carbolic acid, 60 per cent., casks included, east coast 1s. 6½d. to 1s. 7d., west coast 1s. 6¼d. to 1s. 6½d. Naphthalene, £4 10s. to £8 10s.; salts, 37s. 6d. to 42s. 6d., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1⅝d. per unit, packages included and delivered.

Sulphate of Ammonia.

This article is steady and particularly firm for prompt delivery. It would appear that several of the dealers have had to buy a fair quantity in order to complete their March shipments. The principal London Gas Companies are, of course, practically out of the market for prompt delivery; but they still quote £12 5s. for forward, and report having refused £12 2s. 6d. for prompt delivery. In London, the outside makes have been sold at £12 to £12 2s. 6d. upon Beckton terms; while business has been done for delivery April-June at £11 17s. 6d. In Hull, business has taken place for prompt shipment at £12 1s. 3d. to £12 2s. 6d., and for forward at £12. In Liverpool, £12 2s. 6d. is reported to have been paid for prompt delivery. In Leith, the market is firm, and there is very little stuff to be obtained for early delivery; £12 2s. 6d. to £12 5s. being the prices asked.

How to Minimize Slot-Meter Robberies.—Mr. W. R. Wilson, the Engineer and Manager of the Kendal Gas and Water Works, writes: "We have had an epidemic of slot-meter thefts just recently in empty cottages; but though some dozen meters have been broken open, small amounts of a few coppers only have been extracted, and in four instances the thief was frustrated. The meters tampered with were found on examination to be sound, the cash-boxes badly damaged, and the locks missing. Though the price of gas burnt through prepayment meters has been reduced, the change-wheels have not been altered to the present rate; and in consequence consumers receive a small sum back on collection. The consumers and my Committee like this; but it has the further advantage that, when a consumer leaves his dwelling, he comes voluntarily to the Gas Office demanding his meter to be emptied, so as to secure payment of the surplus due."

COAL TRADE REPORTS.

Lancashire Coal Trade.

There has been a slight falling off in the demand for house and shipping coal during the week on the Manchester Exchange; but it is not regarded as of any moment. It has not been sufficient to cause any reduction in prices. A few inquiries for gas coal and cannel keep coming into the market; but so far colliery proprietors set their faces against entering into contracts below last year's terms, with some sort of provision in addition for the proposed shorter hours in mines should the Eight Hours Bill pass. In the West Yorkshire district, house coal is reported lower in price; and easier terms are accepted for slack, a fair amount of which passes into North-East Lancashire. Export coal from Hull continues firm; Germany just now taking practically all that can be sent to her from this quarter. An eight weeks' strike at a Nottinghamshire colliery has ended by the miners—3000 or 4000 in number—going back to work.

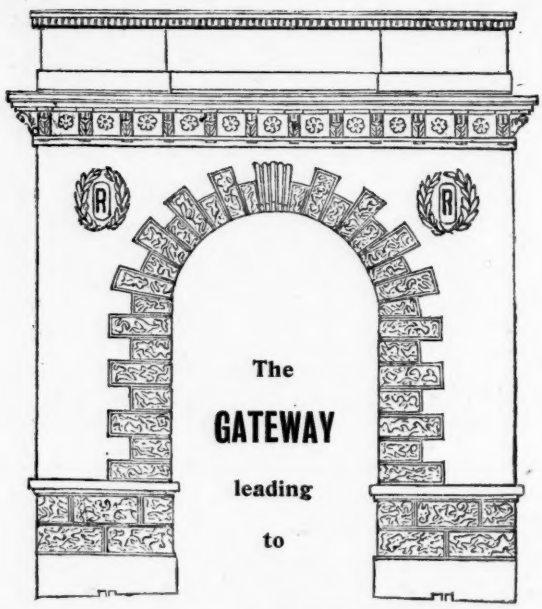
Northern Coal Trade.

The coal trade has shown greater activity; the increase in the foreign demand having more than counterbalanced the fall in the home consumption, due to the effect of local strikes. In steam coals, the inquiry is full. The shipment of coals from the north-eastern ports has attained the large amount of 90,000 tons daily, the greater part of which is being sent abroad. Best Northumbrian steams are 12s. 3d. to 12s. 6d. per ton f.o.b., second-class steams are 11s. to 11s. 3d., and steam smalls are 6s. 6d. to 7s. 6d. Work is well maintained at the collieries; and the heavy output is taken up. In gas coal, prices are generally steady, and the consumption is very full for this season. Durham gas coal is steadier in price, which varies from about 10s. 6d. to 11s. for the usual classes, according to quality, and about 12s. for special sorts. Some small contracts have been placed in the last few days—one of about 8000 tons, at a price equivalent to perhaps 10s. 3d. for second-class coals. Most of these contracts, however, are for coal delivered; and thus the allowance for the sea freight must modify the f.o.b. price. Coke is steady; and gas coke shows a little ease. The prices vary from 16s. to 18s. per ton f.o.b.

Scotch Coal Trade.

Trade continues depressed. There is difficulty in getting away the yield; there being little demand for prompt delivery. Forward business is very weak, as in the falling market orders are not forthcoming. At many collieries full time is not being worked for want of orders. The prices quoted are: Ell 10s. 3d. to 11s. per ton f.o.b. Glasgow, splint 10s. 9d. to 11s. 3d., and steam 10s. 6d. to 10s. 9d. The shipments for the week amounted to 216,448 tons—an increase of 26,222 tons upon the previous week, but a decrease of 47,525 tons upon the corresponding week of last year. For the year to date, the total shipments have been 2,035,778 tons—a decrease of 325,871 tons upon the corresponding period of 1907.

RICHMOND'S COOKERS AND INSTALLATIONS.



INCREASED DAY AND SUMMER CONSUMPTION.

Advertisement of the RICHMOND GAS STOVE & METER CO., LTD.
London Offices and Show-Rooms: 132, Queen Victoria Street, E.C. General Offices and Works: Warrington, &c.

Incandescent Gas Displaces Electricity at Bolton.

Some time ago, the Bolton Corporation adopted incandescent gas-burners for street lighting purposes; and so successful did the experiment prove, that they are now in use practically over the whole town. The advantage of the inverted as compared with the upright burner has been fully demonstrated in the opinion of the Gas Committee; and about 4000 of these lamps are in use in the borough. An interesting point in connection with this matter is that the four electric lamps in use in Victoria Square, fronting the Town Hall, are to give place to half-dozen inverted incandescent two-burner lamps. This change has been decided upon in consequence of the representations made to the Gas Committee by a deputation of tradesmen who urged the need of the improved lighting of the square and of the fact that the Committee are satisfied with the efficiency and economy of the incandescent gas-lamps.

Lectures to Glasgow Gas Employees and Plumbers.

Acting on the advice of their Engineer (Mr. Alex. Wilson), the Gas Committee of the Glasgow Corporation, following the lead of other large undertakings, arranged with Mr. W. H. Y. Webber to give a series of three lectures to their fitters, inspectors, &c., and also to the members of the Plumbers' and Ironmongers' Association. The lectures were delivered on the 9th, 10th, and 11th inst., in the large hall of the Glasgow and West of Scotland Technical College, and were taken advantage of by large numbers of the employees and others. Bailie M. W. Montgomery, the Convener of the Gas Committee, presided at the first lecture; Councillor Paxton, the Sub-Convener, at the second; and Councillor Sutherland, the Convener of the Stoves Committee, at the third. In his first lecture, Mr. Webber dealt with modern methods of gas lighting; showing and describing various burners and lamps and their proper adjustment. In the second lecture, very clear explanations were given of the special properties of the bunsen burner, and interesting experiments were made to prove which are the most effective flame temperatures to be aimed at so that the best results can be obtained when gas is burned as a fuel. In his last lecture, Mr. Webber had for his subject gas-cookers and domestic gas appliances; his remarks being principally based on the "Glasgow" cooker, which he described as embodying all the good points of other designs, and making, as a complete article, one of the best things of the kind he had seen. Many of the latest styles of lamps (including the Glasgow incandescent sun burner), fittings, and general gas appliances were exhibited and explained.

Gas Testing at Portsmouth.—A petition to the Board of Trade was resolved upon last Tuesday by the Portsmouth Town Council in favour of having more than one gas-testing station in the borough.

Increased Storage at the Manchester Gas-Works.—At the meeting of the Gas Committee of the Manchester Corporation last Friday, it was decided, subject to the approval of the Council, to accept the tender of Messrs. Ashmore, Benson, Pease, and Co., Limited, of Stockton-on-Tees, for the construction of a gasholder, of 10 million cubic feet capacity, at the Bradford Road works, for £52,600.

Camborne Public Lighting.—At a recent meeting of the Camborne Urban District Council, a letter was received from the Electric Supply Company offering to erect 50 lamps instead of the 30 gas-lamps already fixed, and to guarantee that the light between the lamps should be three times as good as it is at present. They would also erect free from six to nine lamps for a month, to show what they were prepared to do. It was at first resolved that the matter should be deferred until the gas contract came up for consideration. At a later stage, however, Mr. Caldwell presented the report of the Lighting and Improvement Committee, who recommended that the new contract of the Gas Company should be signed and sealed. After some discussion, it was resolved (only three voting to the contrary) that the contract with the Gas Company be sealed forthwith.

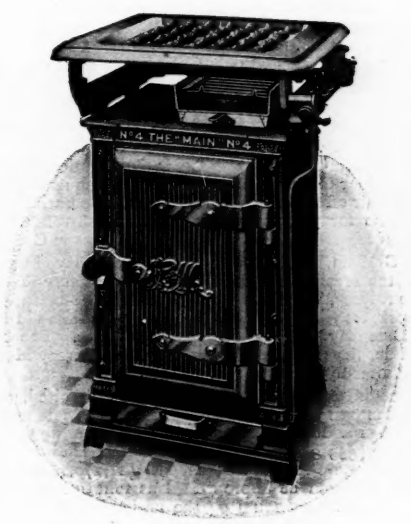
Employees' Dinner at Wandsworth.—Following a custom which has been in existence for some few years, the employees of the Wandsworth and Putney Gas Company held their annual dinner on the 29th ult. It took place in the Wandsworth Town Hall, under the presidency of Mr. H. O. Carr, the Company's Engineer. In proposing the toast of "The Prosperity of the Wandsworth and Putney Gas Company," the Chairman emphasized the fact that, small as the Company was compared with the other Metropolitan Gas Companies, they supplied the cheapest gas in London. Indeed, there were only some four or five companies in the United Kingdom who sold gas as cheaply. It was a great achievement, and something to be proud of. In spite of dear coal, the Company had been able to keep on at their old price for gas; and this left in the ratepayers' pockets the money with which to pay their rates, and in many ways kept these down. The low rates and cheap gas attracted manufacturers to the district; and within the past few months the Premier Record Company had established themselves there, and consumed gas at the rate of about 12 million cubic feet a year. In conclusion, the Chairman remarked that the Directors of the Company were always mindful of the interests of the employees; and if they all united and used their efforts to pull in the right direction, there would be no question about the future prosperity of the Company. The toast having been cordially honoured, the Secretary (Mr. C. W. Braine) responded. He said the Company had never stood in better odour with the consumers than now; and the assembly that evening proved that there was a great deal of good fellowship existing. They met each year at the festive board, and enjoyed themselves; and it showed good feeling, and one that was present in their every-day work. The Company supplied a good district, and employed a great number of men. The wages bill for the year amounted to something like £40,000, which meant a good deal for Wandsworth; and perhaps they did not feel the effects of bad trade as others had done, because gas was a necessity. Among the other toasts was that of "The Chairman," proposed by Mr. Godwin, who said the longer they were associated with him the more they liked him. Mr. Carr briefly acknowledged the toast. The dinner was followed by an enjoyable entertainment.

SEASON 1908.

The "MAIN"

Gas

Cookers



AN IMPORTANT POINT!

All Internal Fittings, Shelf Guides, Shelves, and Grids in the **"MAIN"** Cooker are **Porcelain Enamelled,** preventing Smell, and keeping interior Beautifully Clean. (No extra charge).

R. & A. MAIN, LIMITED,

LONDON, GLASGOW, AND FALKIRK,

ALSO AT

BIRMINGHAM, BRISTOL, MANCHESTER, MELBOURNE, AND SYDNEY.

Failure of the Electric Light at Felixstowe.—The well-known east-coast resort of Felixstowe is coming into unenviable prominence on account of its electric light undertaking, the general position of which has already been commented upon in our columns. The latest vagary occurred last Tuesday evening, when the light, both in private houses and in shops, went out, and darkness prevailed for about half-an-hour. A breakdown at the works is stated to have been the cause of the trouble.

Theft from a Gas-Meter by a Lad.—At the Reigate Borough Bench on the 7th inst., Charles Wood, a lad, was charged with breaking into a dwelling-house and stealing 3s. from a gas-meter. Mr. G. Western, the prosecutor, stated that the house was empty the previous afternoon; and on his return home he found the back cellar window had been broken and the gas-meter tampered with—the lock having been forced open and the money-box emptied. He estimated at 3s. the value of the coins abstracted. A constable deposed to taking the accused into custody, and charging him with the theft, to which he confessed; saying he opened the meter with a chisel and took 3s., of which he gave his mother 1s., kept 5d., and spent the rest. He was remanded till last Wednesday, when he was ordered to be sent to a reformatory school till he was nineteen.

The Directors of the Yorktown and Blackwater Gas Company have decided to reduce the price of gas 2d. per 1000 cubic feet from the 1st prox.

The Directors of the Shanghai Water-Works Company, Limited, recommend final dividends of 37s. 6d. and 30s. 5d., free of income-tax, on the old and new shares respectively, for the past year.

The Pontypool Gas and Water Company have recently completed the enlargement of their Cwmavon storage reservoir; and in order also to meet an increased water demand, they have secured fresh sources of supply and provided additional filtration plant.

The Davis Gas-Stove Company, Limited, have just held a very successful "Travellers' Conference," when the firm's special features for 1908 were fully examined and discussed; and the new "Davis" series of green enamelled steel cookers were favourably commented upon by all present.

The Southbank and Normanby Gaslight and Coke Company have placed an order with Messrs. Robert Dempster and Sons, Limited, of Elland, for a steel tank and gasholder to hold half-a-million cubic feet of gas. The contract includes foundations; and the holder is to be on the spiral-guided system.

The Cleckheaton Urban District Council have, on the recommendation of their Engineer (Mr. George Niven), decided to adapt the Hudson patent producer to their regenerator settings, and have placed the order for the alteration of six settings with Messrs. F. C. Sugden and Co., of Leeds.

The Water Committee of the Leeds Corporation have arranged with the Low Moor Company, Limited, for the acquisition of land for a service reservoir off Dewsbury Road. The Corporation will pay the Company £4000 for 3 acres of land and the surrender of mineral rights. The agreement has just been approved by the Corporation.

Messrs. Graham, Morton, and Co., of Leeds, have secured a large contract for the erection of labour-saving machinery—consisting of elevators, conveyors, crushers, jigging-screens, line-shafting, gearing, structural work, &c.—in connection with the new works of the British Aluminium Company, at Kinlochleven, Argyllshire. The plant is to be erected under the superintendence of Mr. W. Murray Morrison, the Technical Adviser to the Company.

The Directors of Messrs. C. & W. Walker, Limited, report that the profit for the past year, after charging Directors' fees and depreciation on buildings and plant, amounts to £9051. Adding the balance brought forward (£5319), and deducting the interim dividends (£3100) paid last August, there remains for disposal £11,270, which the Directors recommend should be appropriated as follows: Dividend at the rate of 5½ per cent. per annum on the preference shares for the six months ending Jan. 31 last, £1100; dividend at the rate of 10 per cent. per annum, free of income-tax, on the ordinary shares for a like period, £2000; and addition to the reserve fund (making it £27,000), £2000—leaving to be carried forward £6170. While competition during the past year was as keen as ever, the Directors report a substantial increase in the amount of business done, which has resulted in a corresponding addition to the profits of the Company; this being largely due to improvements which have been effected in the plant.

The seventeenth annual meeting of the Richmond Gas Stove and Meter Company, Limited, was held last Thursday at Warrington, under the presidency of Mr. Thomas Dwerryhouse. The report of the Directors showed that the balance standing to the credit of profit and loss account (after deducting debenture interest), including the amount brought forward, was £25,504. It was recommended that the sum be appropriated as follows: Depreciation on buildings, patterns, plant, &c., £5281; dividend on preference capital at the rate of 6 per cent. per annum, £5933; dividend (free of income-tax) at the rate of 10 per cent. on the ordinary capital for the year ended Dec. 31, £8036; bonus (free of income-tax) at the rate of 2½ per cent. per annum, £2009; special reserve account to meet depreciation on investments, £1244; balance to the next account, subject to Directors' remuneration, £3000. The Chairman, in moving the adoption of the report and accounts, pointed out that the profit made last year was less than in the previous twelve months; but they had had a curious year. The price of raw materials went up; and they had to suffer for that. Almost everything in which they dealt rose; and they could not get a corresponding increase in the price of their goods. A great deal of expense had been incurred in the erection of the new foundry. Then, again, the rise in the price of coal had reacted on them, because gas managers had had to economize. He thought, however, looking over the whole of the year and the extraordinary circumstances, that they had done fairly well. In 1903, their reserve was £17,000; and now it was £40,000. They had built and equipped the new foundry without calling up a penny of capital. The report was adopted; and it was agreed to place £700 at the disposal of the Directors for their services last year.

THE
PARKINSON
STOVE CO., LTD.
SLOT COOKERS

Intermediate Grade
COOKERS.

Write—
THE PARKINSON STOVE COMPANY, LTD.,
Stour Street, Spring Hill,
BIRMINGHAM.

Messrs. Henry Balfour and Co., Limited, of Leven, N.B., write to point out that—in the account given last week of the new gas-works at Kirkintilloch—it should have been stated that the purifiers supplied by them were fitted, not with Spencer's "Hurdle" grids, but with No. 2 pattern "Standard" grids, for which they are the Sole Agents in Scotland.

In the Agricultural Hall, Heathfield, from Tuesday to Friday last week, Mrs. A. M. Collins delivered an interesting series of cookery lectures in connection with an exhibition of gas appliances held at the gas-works of the East Sussex Gas and Water Company, Limited. The lectures were given twice daily. At the evening lecture on Thursday a complete dinner was cooked; and on Friday one suitable for a working man's family. The stove used was one of Messrs. Fletcher, Russell, and Co.'s.

It was officially stated last Thursday that the draft Order of the Local Government Board providing for the federation of the six Potteries towns is completed, and that copies will be laid this week before the Councils concerned.

The Bill authorizing the Municipality of Vienna to raise a loan of £15,000,000 for gas and electricity purposes, to which reference has already been made, has received the sanction of the Diet of Lower Austria, and has thus acquired force of law.

The Barry Urban District Council have decided to retain the services of Mr. E. W. Waite, the Water Engineer, in another capacity. It will be remembered that some time ago the Council resolved to place the gas and water undertakings under one management; and notice was given both to the Gas Manager (Mr. F. M. Harris) and to Mr. Waite to determine their engagements.

"ILLUMINATING TRUTHS."

LEAFLETS FOR DISTRIBUTION.

No. 1.—"The Sanitary Aspects of Gas and Electric Lighting."
No. 2.—"The Cleanliness of Illuminants: The Eyesight."
No. 3.—"Fire Risks."
No. 4.—"The Relative Cost of Gas and Electricity, and Matters affecting it."
No. 5.—"On Reliability, with Instances of Misplaced Confidence."
No. 6.—"On Shop Lighting, with Special Reference to the Flame Arc Lamp."
No. 7.—"The Osram Lamp: Fiction and Fact."

This series of Leaflets will be useful, not only for distribution among Householders generally, but for circulation among Shareholders to fortify them with arguments in defence of the commodity in which they have invested capital. Copies of each Leaflet should also be kept in every Gas Undertaking's Show-Rooms.

Prices for Quantities on Application to WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

COKE-OVEN MANAGER. No. 4916.
DRAUGHTSMAN. Gloucester Gas-Works. Application by March 26.
DRAUGHTSMAN (ESTIMATING). Ashmore, Benson, Pease, and Co., Ltd., Stockton-on-Tees.
ASSISTANT SUPERINTENDENT (MAINS AND SERVICES). Applications by March 28.
MANAGER. Burgess Hill and St. John's Common Gas Company. Applications by March 31.
WORKING FOREMAN. Thornton Gas Works. Applications by March 28.

Situation Wanted.

REPRESENTATIVE. G. W., c/o Streets, Cornhill.

Plant, &c. (Second-Hand) for Sale.

COMPLETE GAS-WORKS. Hafod Colliery, Ruabon.
PURIFIERS. Long Eaton Gas-Works.
STATION METER. R. Laidlaw and Son, Edinburgh.

Business for Disposal.

KELVINDALE CHEMICAL COMPANY. A. M. Gourlay, 24, George Square, Glasgow.

Patents (Exploiting).

PRODUCERS, &c. Haseltine, Lake, and Co., Southampton Buildings, W.C.

Company Meetings.

BRITISH GASLIGHT COMPANY. London Office. March 25, Twelve o'clock.
OTTOMAN GAS COMPANY. London Office. March 24, One o'clock.

Stocks and Shares.

WEST SURREY WATER COMPANY. April 13.

Loans Wanted.

DURHAM GAS COMPANY.

TENDERS FOR

Benzol.

BRIDGEWATER COLLIERIES COKE-WORKS. Tenders by April 13.

Coke.

WANDSWORTH AND PUTNEY GAS COMPANY. Tenders by March 19.

Gasholder.

TORQUAY GAS DEPARTMENT. Tenders by March 30.

General Stores (Oils, Lime, Shovels, Buckets, &c.).

ROCHDALE GAS DEPARTMENT. Tenders by March 18.

Iron (Bar and Sheet).

ROCHDALE GAS DEPARTMENT. Tenders by March 18.

Oil for Gas Manufacture.

MANCHESTER GAS DEPARTMENT. Tenders by March 27.

Pipes, &c.

ROCHDALE GAS DEPARTMENT. Tenders by March 18.
WILMSLOW AND ALDERLEY EDGE GAS COMPANY. Tenders by March 24.

Tar and Liquor.

W. H. BENSTED AND SON, Maidstone.
EAST HULL GAS COMPANY. Tenders by March 24.
HAWORTH URBAN DISTRICT COUNCIL. Tenders by March 23.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 681.

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
500,000	10	Oct. 11	10½	Alliance & Dublin 10 p.c.	20—21	..	5 0 0	561,000	Stk.	Feb. 27	10	Liverpool United A . .	220—222	+2	4 10 1
268,324	¹0	,,	7⅛	Do. 7 p.c.	14—15	..	5 0 0	718,100	,,	,,	7	Do. B . .	161¼—163¾	..	4 5 8
310,000	Stk.	Jan. 16	4	Do. 4 p.c. Deb.	100—103	..	3 17 8	306,083	,,	Dec. 30	4	Do. Deb. Stk.	106—108	..	3 14 1
200,000	5	Oct. 30	7	Bombay, Ltd.	6¾—6⅞	..	5 3 8	152,736	Stk.	Feb. 13	7⅝	Maidstone 5 p.c. . .	136—141	..	5 8 2
40,000	5	,,	7	Do. New, £4 paid	4¾—5	..	5 12 0	75,000	5	Nov. 28	5	Malta & Medn., Ltd. .	4¼—4⅝	..	5 5 3
50,000	10	Feb. 27	14	Bourne- mouth Gas and Water } 10 p.c. . .	27—28	..	5 0 0	560,000	100	Oct. 1	5	Met. of } 5 p.c. Deb. .	101—103	..	4 17 1
51,810	10	,,	7		16¼—16¾	..	4 3 7	250,000	100	,,	4½	Melbourne } 4½ p.c. Deb.	101—103	..	4 7 5
53,200	10	,,	6		14—15*	..	4 0 0	541,920	20	Nov. 14	3½	Monte Video, Ltd. . .	10½—11½	..	6 1 9
380,000	Stk.	,,	12½	Brentford Consolidated	242—247	..	5 1 3	1,775,892	Stk.	Feb. 27	4⅝	Newc'tle & G'tesh'd Con.	106½—107½	..	4 6 1
500,000	,,	,,	9⅜	Do. New . . .	180—185	..	5 2 8	418,460	Stk.	Dec. 30	3½	Do. 3½ p.c. Deb.	87—88	..	3 19 7
50,000	,,	,,	5	Do. 5 p.c. Pref. .	118—123	..	4 1 4	15,000	10	Feb. 27	10	North Middlesex 10 p.c.	20—21	+1	4 15 3
206,250	,,	Dec. 13	4	Do. 4 p.c. Deb. .	100—105	..	3 16 2	55,940	10	,,	7	Do. 7 p.c.	13½—14½	+1	4 16 7
220,000	Stk.	Mch. 12	11½	Brighton & Hove Orig.	195—205*	+¾	5 9 9	300,000	Stk.	Nov. 28	8	Oriental, Ltd. . . .	140—143	..	5 11 11
246,320	,,	,,	8½	Do. A. Ord. Stk. .	152—157*	+1	5 5 1	60,000	5	Sept. 13	7	Ottoman, Ltd. . . .	6—6½	..	5 7 8
460,000	20	,,	10	British	43—44	..	4 10 11	398,490	5	Oct. 30	7	Primitiva Ord. . . .	6¾—7¼	..	4 16 7
104,000	Stk.	Feb. 13	6	Bromley, Ord. 5 p.c. .	116—119	..	5 0 10	796,980	5	Jan. 30	5	Do. 5 p.c. Pref. .	4⅜—5⅜	..	4 17 7
165,700	,,	,,	4½	Do. do. 3½ p.c. .	86—89	..	5 1 2	488,900	100	Dec. 2	4	Do. 4 p.c. Deb. .	93—95	*	4 4 3
500,000	10	Oct. 11	7	Buenos Ayres (New) Ltd.	11½—12	..	5 16 8	1,000,000	10	Oct. 11	8	River Plate Ord. . . .	13⅜—14	..	5 14 4
250,000	Stk.	Dec. 13	4	Do. 4 p.c. Deb. .	93—95	..	4 4 3	312,650	Stk.	Dec. 30	4	Do. 4 p.c. Deb. .	93—95	..	4 4 3
150,000	20	Mch. 12	7½	Cagliari, Ltd.	25—26*	..	5 11 6	250,000	10	Sept. 27	8	San Paulo, Ltd. . . .	13—13⅜	..	5 18 6
100,000	10	—	—	Cape Town & Dis., Ltd.	4—6	..	—	125,000	50	Jan. 2	5	Do. 5 p.c. Deb. .	49—51	..	4 18 0
100,000	10	Apl. 26	4½	Do. 4½ p.c Pref. .	7—9	..	5 0 0	135,000	Stk.	Sept. 13	10	Sheffield A	245—247	..	4 1 0
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	48—50	..	6 0 0	209,984	,,	,,	10	Do. B	245—247	..	4 1 0
103,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.	92—94	..	4 15 9	523,500	,,	,,	10	Do. C	245—247	..	4 1 0
157,150	Stk.	Feb. 27	5	Chester 5 p.c. Ord. .	103½—107½	..	4 13 0	70,000	10	Nov. 14	10	South African	14⅜—15½	..	6 9 0
1,493,280	Stk.	Mch. 12	5⅝	Commercial 4 p.c Stk. .	103—108*	+½	4 16 4	6,429,895	Stk.	Feb. 13	5⅛	South Met., 4 p.c. Ord.	121—123	..	4 6 8
560,000	,,	,,	5	Do. 3½ p.c. do. .	100—105*	+1⅛	4 15 3	1,895,445	,,	Jan. 16	3	Do. 3 p.c. Deb.	83—85	..	3 10 7
475,000	,,	Dec. 13	3	Do. 3 p.c. Deb. Stk.	82—84	..	3 11 5	209,820	Stk	Mch. 12	8	South Shields Con. Stk.	150—152*	..	5 5 3
800,000	Stk.	,,	6½	Continental Union, Ltd.	115—120	..	5 8 4	605,000	Stk.	Feb. 27	5⅜	S'th Suburb'n Ord. 5 p.c.	116—119	..	4 9 7
200,000	,,	,,	7	Do. 7 p.c. Pref.	140—145	..	4 16 7	60,000	,,	,,	5	Do. 5 p.c. Pref. . .	118—121	..	4 2 8
460,170	Stk.	—	5½	Derby Con. Stk. . .	122—123	..	4 9 5	117,058	,,	Jan. 16	5	Do. 5 p.c. Deb. Stk.	120—125	..	4 0 0
55,000	,,	—	4	Do. Deb. Stk. . . .	103—105	..	3 16 2	502,310	Stk.	Nov. 14	5	Southampton Ord. . .	107—112	..	4 9 3
148,995	,,	—	—	East Hull 5 p.c. Ord. .	100—103	..	—	120,000	Stk.	Feb. 27	6⅔	Tottenham } A 5 p.c. .	120—125	+2	5 8 0
486,090	10	Jan. 30	12	European, Ltd. . . .	23—24	..	5 0 0	398,940	,,	,,	5⅓	and } B 3⅓ p.c. .	101—104	+1	5 1 0
354,060	10	,,	12	Do. £7 10s. paid	16½—17½	..	5 2 10	149,470	,,	Dec. 13	4	Edmonton } 4 p.c. Deb.	59—102	..	3 18 5
15,182,590	Stk.	Feb. 13	4 1/10	Gas- } 4 p.c. Ord. . .	94—96	—¼	4 11 7	182,380	10	Dec. 30	8	Tuscan, Ltd.	10¼—10⅝	..	7 8 10
2,600,000	,,	,,	3⅜	light } 3⅜ p.c. max. .	87—89	+1	3 18 8	149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	98—100	..	5 0 0
3,799,735	,,	,,	4	and } 4 p.c. Con. Pref.	106—109	+1	3 13 5	193,742	Stk.	Feb. 27	5	Tynemouth 5 p.c. max.	105—107	..	4 13 6
4,193,975	,,	Dec. 13	3	Coke } 3 p.c. Con. Deb.	82—84	..	3 11 5					Wands-			
258,740	Stk.	Mch. 12	5	Hastings & St. L. 3½ p.c.	91—96*	+½	5 4 2	255,636	Stk.	Feb. 13	6½	worth } B 3½ p.c. . .	128—133	..	4 17 9
82,500	,,	,,	6½	Do. do. 5 p.c.	112—115*	+1¼	5 13 1	80,075	,,	Dec. 30	3	and } 3 p.c. Deb. Stk.	73—78	..	3 16 11
70,000	10	Oct. 11	11	Hongkong & China, Ltd.	19—20	..	5 10 0					Putney			
4,940,000	Stk.	Nov. 14	8	Imperial Continental .	178—181	—1	4 8 5	845,872	,,	Feb. 27	5⅜	West Ham 5 p.c. Ord. .	101—104	..	4 18 6
473,600	Stk.	Feb. 13	3⅜	Do. 3½ p.c. Deb. Red.	92—94	..	3 14 6	185,000	,,	,,	5	Do. 5 p.c. Pref. . .	118—120	..	4 3 4
195,242	Stk.	Mch. 12	6	Lea Bridge Ord. 5 p.c. .	113—118*	+1	5 1 8	228,300	,,	Dec. 30	4	Do. 4 p.c. Deb. Stk.	102—107	..	3 14 9

Prices marked * are "Ex div."

At a meeting of the Tiverton Town Council on Monday last week, the Lighting Committee reported having received and considered tenders for the new gasholder, governor, steam-boiler, and engine at the gas-works, and recommended the acceptance of that of Messrs. Willey and Co., of Exeter, for the whole work, exclusive of the foundations, at £3026. Mr. J. Thorne, in moving the adoption of the report, said Messrs. Willey's offer was the lowest; and, having had previous experience of their work, the Committee had no hesitation in recommending their tender for acceptance. The proposition was adopted.

Mr. G. E. Wright presided at the annual meeting of John Wright and Eagle Range, Limited, last week, and moved the adoption of the report. This showed a profit for the year of £54,437. After adding the balance brought forward (£8381), and deducting the interim dividends paid in August, there remained a disposable sum of £44,872. The Directors recommended the payment of a dividend at the rate of 6 per cent. per annum for the half year on the preference shares, and of 2s. 6d. per share on the ordinary shares for the second half year, making 20 per cent. for the year. A sum of £8000 was placed to reserve, and £8574 carried forward. The Chairman said the figures bore a wonderful resemblance to those of the previous year; the profit having increased by about £300. Alluding to a paragraph in the report stating that he did not intend to offer himself for re-election as a Director, he said he had been connected with the Company since its formation in 1890. At that time the capital was £80,000. In 1900, they amalgamated with the Eagle Range Company; and the result had been entirely satisfactory to the shareholders of both businesses. The subscribed capital of that Company was £55,000, so that the total capital subscribed by the shareholders from beginning to end was £135,000. In issuing the prospectus, the Directors foreshadowed possible yearly profits to the amount of about £12,500. In the first year this sum was exceeded; and almost without interruption the profits had gone up year by year, the only falling off being a slight decrease in 1895. Since the formation of the Company, the Directors had paid in dividends a sum amounting to upwards of £400,000. They had not divided up to the hilt as they might have done; from the beginning they adopted a conservative policy with reference to the profits. They had retained in the business a certain amount of the profits of each year, so that the capital employed was the £135,000 which the shareholders had subscribed, *plus* the accretions of profits they had left in the business. As these profits were used for capital, the Directors from time to time distributed a bonus in the form of cash, but really as shares, because the shareholders were given the opportunity of investing the bonus in shares at par. In addition to the £400,000 paid in dividends, the bonuses distributed amounted to about £130,000. This meant that the original investor of £100 now held ordinary shares of the nominal value of £300, *plus* a certain amount in preference shares included in the bonuses; and the market price to-day of these shares was such that the original investment of £100 was now worth upwards of £900. As the business was in such a satisfactory condition, it made it easier now for him to take the step he had wished to take for some time, and retire from active business. The interests of the Company would not suffer, for Mr. H. J. Yates, who was taking charge of the department with which he had been specially identified, had during the last two years become thoroughly conversant with the work. Mr. Brodie spoke of the eminent services rendered by Mr. Wright, and said the success of the Company had been largely due to him. Now that Mr. Wright was retiring, he (the speaker) proposed that he should be voted a special sum of 500 guineas, and that £100 should also be spent in the purchase of a service of plate to be presented to him as a mark of the respect and esteem in which he was held by the shareholders. This proposal was unanimously agreed to; and the Chairman acknowledged the gift.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

OXIDE OF IRON.

O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE,

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

BROTHERTON & CO., LIMITED.
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

TEMPERLEY TRANSPORTERS
FOR Rapid and Economical Handling
of Coal and Coke in Gas-Works.
Next displayed advertisment will appear on March 24.
APPLEBYS LIMITED.
58, VICTORIA STREET, WESTMINSTER, S.W.
Telephone: 369 WESTMINSTER. Telegrams: "MILLWRIGHT" LONDON.

RETORT CARBON—I buy all qualities and Supply the Trade.
Write V. DASNIÈRES, 10, St. Mary Axe, LONDON, E.C.

AMMONIA.
Consumers in any form are invited to correspond with CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.

"NUGEPE" GAS PLANT CEMENT.
JOHN E. WILLIAMS AND CO.,
LOWER MOSS LANE,
MANCHESTER, S.W.
For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 54 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 254 Oldham, and 2412 Hop, London.
Telegrams:—
"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

DUTCH OXIDE OF IRON.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

THE First Dutch Bogore Co., Ltd.,
NYMEGEN, HOLLAND.
General Manager (for England and Wales)—
CHARLES E. FRY, LEAMINGTON,
General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

BENZOL
AND
CARBURINE FOR GAS ENRICHING.
ALSO
THE MAXIM PATENT CARBURETTOR.

For Prices, &c., apply to
THE GAS LIGHTING IMPROVEMENT CO., LTD.,
7, BISHOPSGATE STREET WITHOUT,
LONDON, E.C.
Telegraphic Address: "Carburine, London."

PINCHBECK'S Meters and Burglar PROOF STRONG BOX.
See illustrated advertisement, March 3, p. I. of Centre.
J. PINCHBECK & Co., Adams Place, George's Road, HOLLOWAY, N.

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, WAKEFIELD, and SUNDERLAND.

GAS TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, WAKEFIELD, AND SUNDERLAND.

OXIDE OF IRON.
(NATURAL.)
SPENT OXIDE PURCHASED.
BALE'S FIRE CEMENT.
PAINT FOR GAS-WORKS.
BALE & CHURCH,
5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.

SPECIALLY prepared for the Manu- facture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL, LTD.,
with which is amalgamated WM. PEARCE & SONS, LTD.
36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341 AVENUE.

PATENTS AND TRADE MARKS
PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 & 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

AMMONIACAL Liquor wanted.
CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.
Telegrams: "CHEMICALS."

GAS PLANT for Sale—We can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED, Thornhill, DEWSBURY.

AMMONIACAL Liquor wanted.
BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, WAKEFIELD, AND SUNDERLAND.

JOHN RILEY & SONS, Chemical Manu- facturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitrol, which has now been used for upwards of 50 Years. References given to Gas Companies.

ROBERT DEMPSTER & SONS, Ltd., Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, Rose Mount Iron-Works, Elland.

GAS OILS.

MEADE-KING, ROBINSON, & CO. Represent the Strongest Independent Refineries in America; also Petroleum Spirit for Gas Enrichment. 18, Exchange Street, Manchester, and 11, Old Hall Street, Liverpool.

SULPHURIC ACID.

SPECIALLY prepared for Sulphate of AMMONIA Makers by
CHANCE AND HUNT, LIMITED,
Works: Oldbury, Wednesbury, and Stafford.
Address Correspondence and Inquiries to Oldbury, Worcs.
Telegrams: "Chemicals, Oldbury."

GAZINE—A radical Solvent and Pre- ventative of Naphthalene deposits, and the Automatic cleaning of Mains and Services.
It is also used for the Enrichment of Gas, and has an illuminating value double that of 90 per cent. Benzol.
Supplied by C. Bourne, West Moor Chemical Works, Killingworth, or through his Agent, F. J. Nicol, Pilgrim House, Newcastle-on-Tyne.
Telegrams: "Doric," Newcastle-on-Tyne. National Telephone No. 2497.

SULPHATE OF AMMONIA SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We guarantee promptness, with efficiency for Repairs.
Joseph Taylor and Co., Central Plumbing Works, Bolton.
Telegrams: Saturators, Bolton. Telephone 0848.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no back Pressure.
The Cheapest in the Market.
Can be Exchanged for Spent Oxide.
Read Holliday and Sons, Ltd., Huddersfield.

TO Gas Managers, &c., Wanted, Old Condemned GAS-METERS, from 1-light to 1000-light, for destruction to re-claim Metals. Write for Prices, Stating Quantities and Sizes, and if Wets or Drys. Scrap Metals, Drosses, Metal Shop Sweepings, &c., also bought.
J. Wilson, Pleasant Grove, York Road, King's Cross, London, N.

BRISTOL RECORDING GAUGES AND THERMOMETERS.

J. W. & C. J. PHILLIPS, 23, College Hill, London, E.C., and 7, Park Square, Leeds.

GAS Engineer desires to Represent a Firm of GAS PLANT MAKERS; also a good GAS COAL. Bristol district.
Address "G.W.," care of Streets, 30, Cornhill, E.C.

WANTED by a Firm of Tar Paving Manufacturers, a large quantity of COAL-GAS TAR. Would be willing to make a Contract for Twelve Months.
W. H. Bensted and Son, Maidstone.

COKE-OVEN Manager wanted for a Plant at a Colliery near Newcastle-on-Tyne. Should have Experience in Benzol Recovery and Tar Distilling.
Applications, stating Age, Wages Required, and Experience, with *copies* of Testimonials, to be sent to No. 4916, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

ESTIMATING Draughtsman Wanted. Applicants must have a Good Knowledge of General Engineering. Experience in Gas-Works Plant would be a Recommendation.
Write, with full Particulars, Stating Age, Experience, References, and Salary required, also when at liberty, to Ashmore, Benson, Pease, and Company, Limited, Stockton-on-Tees.

CITY OF LEEDS.

THE Gas Committee require the Services of an ASSISTANT to the Superintendent of the MAINS and SERVICES Department.
Applicants must possess a thoroughly Practical Knowledge of Main and Service Laying, and the Distribution of Gas.
Salary, £130 per Annum.
Applications, stating Age and Experience, with *copies* of not more than three recent Testimonials, and addressed to the undersigned, endorsed "Assistant, Mains Department," will be received not later than Saturday, the 28th inst.
Canvassing Members of the Corporation will disqualify Candidates.
Robert E. Fox,
Town Clerk.
March, 1908.

WANTED a Good Draughtsman, thoroughly acquainted with Gas-Works Plant, also Capable of Designing and Making any Drawings that may be required, and to assist generally in the Engineer's Office. One with a knowledge of Shorthand preferred.
Applications, stating Age, Experience, Salary required, and enclosing Testimonials, to be sent to the undersigned not later than March 26 inst.
W. S. Morland,
Engineer.
Gas-Works, Gloucester.

THORNTON URBAN DISTRICT COUNCIL GAS-WORKS.

WANTED a Working Foreman, able to Lay Mains and Service Pipes, to do Stoking and Gas-Works routine work. Wages 30s. per week, with House, Coal, and Gas.
Applications, with *copies* of Testimonials, to be sent to the undersigned, endorsed "Gas-Works Foreman," not later than the 28th inst.
Richard Bowman,
Clerk.
Council Offices, Thornton,
Via Preston, March 12, 1908.

BURGESS HILL AND ST. JOHN'S COMMON GAS COMPANY.

WANTED, a Manager for the above Works. Applicants not to be over Thirty Years of Age and Practically Acquainted with the Manufacture and Distribution of Gas and Capable and Willing of doing everything necessary for encouraging an extended use of Gas in the District. Present make, about 18 Million feet.
Commencing Salary, £120 per Annum, with House, Coal, and Gas.
Applications, accompanied by Two *copies* of recent Testimonials and endorsed "Application for Manager," to be sent to the undersigned not later than Tuesday, the 31st of March.
S. H. Norman,
Secretary.
London Road,
Burgess Hill, Sussex.

OLD Gas-Works Dismantled by Com- petent Staff, and Best Prices Given for Old Materials.
Firth Blakeley, Sons, and Company, Limited, Thornhill, Dewsbury.

PURIFIERS—Wanted, Sets of 8 feet, 10 feet, and 12 feet square. Will Inspect and make Offer. Removed own Risk and Expense.
Firth Blakeley, Sons, and Company, Limited, Thornhill, Dewsbury.

A SMALL Second-Hand Gas Plant for SALE. Retort-House Fittings, Condenser, Scrubber, Purifiers, Station Meter, Governor, 30-feet Holder. Can be seen at Hafod Colliery, Ruabon.
Apply to Mr. Fisher at the Colliery.

PURIFIERS—For Sale Sets from 6 feet square to 20 feet square. Cheap and Good. Prices and Plans on Application.
Firth Blakeley, Sons, and Company, Limited, Thornhill, Dewsbury.

GASHOLDERS—Few, splendid Second- Hand in Stock from 2000 to 60,000 capacity. Overhauled and Erected in new STEEL TANKS cheap and Guaranteed. Plans and Specifications submitted. Entirely new quoted for.
Firth Blakeley, Sons, and Company, Limited, Thornhill, Dewsbury.

EXHAUSTERS—One set of Waller's Patent Three-Blade Combined with Steam-Engine, overhauled and perfect, to pass 15,000 and 20,000 cubic feet per hour. Also sets in stock for 2000 to 10,000 cubic feet per hour. Photos, Prices, &c., on Application.
Firth Blakeley, Sons, and Company, Limited, Thornhill, Dewsbury.

FOR SALE—Set of Four Water-Lute PURIFIERS, 12 feet square. Cockey's Centre Valve, extra deep Lute. In Good Condition. Bargain for a Works up to 40 Millions. Lifting Gear if required.
For further Particulars, Drawings, &c., Apply to G. Stevenson, Gas-Works, Long Eaton.

STATION Meter, in Square Cast-Iron Case, FOR SALE. The Meter passes 25,000 Cubic Feet of Gas per hour, is in Good Condition, and is fitted with Valves and Connections. A low Price will be accepted.
Apply R. Laidlaw and Son (Edinburgh), Limited, Simon Square Works, Edinburgh, or 6, Little Bush Lane, London.

CHEMICAL BUSINESS FOR SALE.

THE Subscriber invites Tenders for the BUSINESS carried on by the Kelvindale Chemical Company (1904) Limited, at Lochburn Works, Maryhill, including the Works' Plant and Stock-in-Trade.
This Company are Proprietors of the well-known "Pharos" Brand of Sheep Dips, Weed Killer, Disinfectants, Boiler Composition, &c., sold throughout Scotland and the North of England, as well as in some of the Colonies.
A business is also done in high efficiency Cresylic Acid, Carbolic Acid, and Creosote Oil.
Tenders must be lodged with the Subscriber at or before Twelve o'clock noon on Tuesday, April 7, 1908.
For further Particulars, Conditions of Sale, and Order to View the Works, Apply to
A. M. Gourlay, C.A.,
Liquidator.
24, George Square,
Glasgow.

PRODUCER Gas Plants—150 and 300 H.P. GAS-PRODUCING PLANT, complete with Gas-Engines, Gasholders, and Carburetting Plant for Lighting Purposes. Delivered and fixed equal to new. Prices, Plans, and Particulars on Application.
Firth Blakeley, Sons, and Company, Limited, Thornhill, Dewsbury.

BRIDGEWATER COLLIERIES COKE-WORKS.
(The Earl of Ellesmere.)

TENDERS are invited for the Crude BENZOL, testing 80 per cent. at 120° C., produced at the above Works for a period of Six or Twelve Months from the 1st of May, 1908, delivered into Contractor's Tanks at the Bridgewater Colliery Siding, Wharton Hall, on the Pendleton and Hindley Branch of the Lancashire and Yorkshire Railway, or at the Brackley Siding on the Little Hulton Mineral Branch of the London and North Western Railway.
Tenders, endorsed "Tender for Crude Benzol," to be addressed to Mr. Thomas M. Brown, No. 4, Chapel Walks, Manchester, on or before the 13th of April, 1908.
Manchester, March 17, 1908.

WILMSLOW AND ALDERLEY EDGE GAS COMPANY.

THE Directors of the above Company are prepared to receive TENDERS for the Supply of 5600 Yards of 8-inch Spigot and Socket Turned and Bored CAST-IRON PIPES, in 9-feet or 12-feet lengths, together with SPECIALS; delivered as to One-Third at Wilmslow and the remaining Two-Thirds at Handforth Station (London and North Western Railway).
Tenders, marked "Pipes," to be delivered at my Office, No. 52, Brown Street, Manchester, by Tuesday, the 24th of March, 1908.
Any further Information may be obtained from Mr. Severs, Manager, Gas-Works, Wilmslow.
W. H. Welsh,
Secretary.
March 11, 1908.

MANCHESTER CORPORATION GAS-WORKS.

TO OIL IMPORTERS AND OTHERS.

THE Gas Committee of the Corporation of Manchester are prepared to receive TENDERS for the Supply of a Cargo, by the end of July next, of 3000 to 4000 Tons of OIL for the Manufacture of Carburetted Water Gas.
Description of the Oil, Conditions of Contract, and further Particulars may be obtained on Application (in writing only) to Mr. Charles Nickson, Superintendent of the Gas Department.
Sealed Tenders and Samples, addressed to the Chairman of the Gas Committee and endorsed "Tender for Gas Oil," must be delivered at the Office of the Superintendent of the Gas Department, Town Hall, Manchester, on or before Nine a.m., on Friday, the 27th of March, 1908.
The Corporation do not bind themselves to accept the lowest or any Tender.
By order,
Wm. Henry Talbot,
Town Clerk.
Town Hall, Manchester,
March 13, 1908.

BOROUGH OF ROCHDALE.
(Gas Department.)

THE Gas and Electricity Committee of the above Corporation invite TENDERS for the Supply of such quantities of the undermentioned GOODS as they may require during a period of Twelve Months from the 1st of April next—viz:
1.—Cast-Iron Main Pipes and Specials.
2.—Wrought-Iron Tubes and Fittings.
3.—Engine and Cylinder Oils.
4.—Best Hand-Picked Lime for Gas Purification.
5.—Steel Charging Shovels.
6.—Galvanized Iron Buckets (12-inch, 84 lbs. per Doz.).
7.—Bar and Sheet Iron.
Form of Tender for Items 1, 2, and 3, and any other Information, may be obtained on Application to Mr. T. Banbury Ball, the Manager of the Gas-Works, Dane Street.
Tenders, addressed to the Chairman of the Gas and Electricity Committee and properly endorsed, must be sent in to me not later than Noon on Wednesday, March 18, 1908.
By order,
Wm. Henry Hickson,
Town Clerk.
Town Hall, Rochdale,
March 11, 1908.

BOROUGH OF TORQUAY.

GASHOLDER.

THE Gas-Works Committee of the Torquay Town Council are prepared to receive TENDERS for a TWO-LIFT TELESCOPIC GAS-HOLDER, 80 ft. by 82 ft. by 24 ft. deep, to be erected at their St. Mary Church Works.
Drawings and Specification may be obtained from the undersigned on payment of Two Guineas, which will be repaid on receipt of a *bonâ-fide* Tender and the return of the Drawings and Specification.
Tenderers may also submit alternative proposals of their own for a Gasholder of the above size, together with Plans and full Particulars as to the manner in which they would propose to carry out the work.
Further Particulars may be obtained from Mr. Francis Chalmers, Manager at the Gas-Works.
Tenders, sealed up and addressed to the undersigned, marked on the outside "Tender for Gasholder," to be delivered not later than Twelve noon on Monday, the 30th inst.
The Council do not bind themselves to accept the lowest or any Tender.
Fredk. S. Hex,
Town Clerk.
Town Hall, Torquay,
March 13, 1908.

THE Haworth Urban District Council are prepared to receive TENDERS for the Purchase of their Surplus TAR and LIQUOR during the Year ending March 31, 1909.

Tenders to be sent to me not later than March 23, 1908.

WILLIAM ROBERTSHAW,
Clerk.

Burlington Chambers,
North Street, Keighley.

EAST HULL GAS COMPANY.

THE Directors of this Company invite TENDERS for the Purchase of the Surplus TAR at per Ton over the Company's Weighing-Machine (1200 Tons or thereabouts) to be made between the 1st of April, 1908, and the 31st of March, 1909.

Tenders to be sent in on or before Tuesday, the 24th of March, 1908, addressed to the undersigned, endorsed "Tender for Tar."

The Directors do not bind themselves to accept the highest or any Tender.

Further Particulars on Application to the Engineer and General Manager.

DAVID WOOD,
Secretary.

Offices: St. Mark Street,
Hull, March 7, 1908.

COKE.

THE Directors of the Wandsworth and Putney Gaslight and Coke Company invite TENDERS for the Removal of about 8000 Tons of Guaranteed "WANDSWORTH" COKE from their Works at Wandsworth, between April 1 and Sept. 30 next.

The Coke to be removed by Van or by Barge (free waterway on River Thames).

Sealed Tenders, endorsed "Tender for Coke," to be delivered not later than the 19th inst.

The Directors reserve to themselves the right to accept any Tender in part or in whole, and do not bind themselves to accept the highest or any Tender.

Any further Information may be obtained from the Engineer, Mr. H. O. Carr.

CHAS. W. BRAINE,
Secretary.

Wandsworth and Putney Gaslight
and Coke Company, Fairfield Street,
Wandsworth, S.W., March 6, 1908.

BRITISH GASLIGHT COMPANY, LIMITED.

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Wednesday, the 25th inst., at Twelve o'clock precisely, to transact the usual Business and to declare a Dividend for the Half Year ended the 31st of December last.

NOTICE IS HEREBY ALSO GIVEN, that the TRANSFER BOOKS of the Company WILL BE CLOSED on the 14th and re-opened on the 26th inst.

By order of the Court of Directors,
A. W. BROOKES,
Secretary.

Chief Office: No. 11, George Yard,
Lombard Street, London, E.C.,
March 5, 1908.

OTTOMAN GAS COMPANY, LIMITED.

NOTICE is Hereby Given, that the ORDINARY GENERAL MEETING of the Shareholders of this Company will be held at the Offices of the Company, 9, Queen Street Place, Cannon Street, E.C., on Tuesday, the 24th day of March, 1908, at One o'clock in the Afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended the 31st of December last; to declare a Dividend for the same period; to elect Directors and Auditors in place of those retiring; and to Transact the General Business of the Company.

The TRANSFER BOOKS WILL BE CLOSED from the 17th day of March until after the Meeting.

By order of the Board,
THOMAS GUYATT,
Secretary.

9, Queen Street Place,
Cannon Street, London, E.C.,
March 10, 1908.

WEST SURREY WATER COMPANY.

NOTICE is Hereby Given, that the Directors of the above Company intend to Offer for SALE BY TENDER 200 ORDINARY SHARES of £10 each, nominal value (Maximum Dividend 7 per cent. per Annum), in Lots of 5 or more Shares.

The Maximum Dividend of 7 per cent. per Annum has been paid for the past Eight Years upon the 7 per cent. Ordinary Share Capital, and the Maximum Dividend of 10 per cent. per Annum is now paid upon the 10 per cent. Ordinary Share Capital.

The Debenture Stock and Preference Shares of the Company are now, under the Provisions of the Trustee Act, 1893, a Trust Security.

The District supplied by the Company comprises Walton, Oatlands, Hersham, Weybridge, Addlestone, Byfleet, and Chertsey, in Surrey, and Shepperton in Middlesex; Cobham, in Surrey, and Littleton, in Middlesex, are also embraced in the Company's Parliamentary Limits.

Tenders, to be in a Sealed Cover, addressed to the Directors of the West Surrey Water Company, at the Office of the Company, will be received not later than the 13th day of April, 1908.

Forms of Tender and Particulars and Conditions of Sale may be obtained from the Secretary at the Offices of the Company, 38, Parliament Street, Westminster, London, S.W.

By order of the Directors,
WALTER COLBROOK,
Secretary.

March 10, 1908.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including in these Periodical Sales Gas and Water Stocks and Shares belonging to Private Owners, can be obtained on Application to MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

CITY OF DURHAM GAS COMPANY.

THE Directors of the above Company are open to receive a limited number of LOANS on MORTGAGE of not less than £100 each. Terms may be had on Application.

THOS. M. WALLER,
Secretary.

Gas Offices, 18, Claypath,
Durham.

THE Proprietor of the Patents No. 27,519, of 1904, "IMPROVEMENTS IN APPARATUS FOR THE MANUFACTURE OF PRODUCER GAS," and No. 3343, of 1902, "IMPROVEMENT IN OR RELATING TO GAS GENERATORS," is desirous of entering into Arrangements, by way of LICENSE and otherwise, on Reasonable Terms, for the purpose of EXPLOITING the same and ensuring their full Development and Practical Working in this Country.

All Communications should be addressed in the first instance to

HASELTINE, LAKE, AND CO.,
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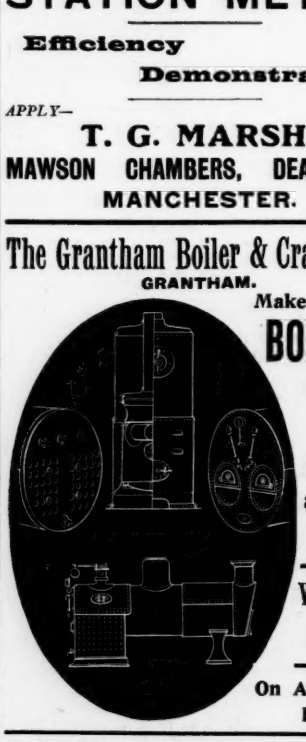

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Vertical, Loco., Cornish, and other Types.

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AND

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Manufacture and keep in Stock at their Works (also large Stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

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BRETTELL'S ESTATE, LIMITED,

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STOURBRIDGE.

Manufacturers of GAS RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

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Highest Results in Gas, & Excellent Coke.

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Rich in Illuminating Power and yield of Gas.

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MIRFIELD GAS COAL.

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Sperm Value 878·85 lbs. per Ton.

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